THE USE OF POCKET ELECTRONIC DICTIONARIES AS COMPARED WITH PRINTED DICTIONARIES BY JAPANESE LEARNERS OF ENGLISH

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

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The Ohio State University 2006

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ABSTRACT

As L2 learners increasingly depend on electronic reference materials, it has become crucial to investigate how such materials are used and what impact they have on L2 learning. Pocket electronic dictionaries (EDs) have particularly become popular among Asian learners of English in the past decade. This study compared the use of EDs with PDs among Japanese university students. It also examined the relationships between students’ ED use and their use of lexical processing strategies (LPS; consult, infer, or ignore), their vocabulary learning, and their reading.

In order to construct a complete picture, this study investigated these issues both quantitatively and qualitatively, through multiple investigative techniques. This study consisted of two phases. In Phase 1, quantitative data were collected from 279 students, using a written questionnaire on LPS use, the Vocabulary Levels Test assessing vocabulary size, and the Reading Comprehension section of the TOEFL assessing reading proficiency. In Phase 2, both qualitative and quantitative data were collected from the 22 students selected from those who participated in Phase 1, through a follow-up interview about the questionnaire, retrospective think-aloud protocols elicited during a reading session, and two types of vocabulary tests administered a week after the reading session to assess word retention.
The findings showed that EDs have become popular tools for Japanese learners of English; the majority of students (72% of 279 students) owned an ED, and those who owned it tended to use it exclusively, although they also owned a PD. The results indicated the complex nature of the effects of EDs. EDs appear to increase the frequency of dictionary consultation by students, particularly by low-proficiency students. In this sense, the effects of EDs on L2 use may be positive. Also, EDs may positively influence long-term L2 learning because frequent dictionary consultation is likely to cumulate in greater vocabulary learning in the long run. However, EDs may not benefit all students equally. The increase in the frequency of dictionary consultation may be accompanied by varying degrees of decrease in the frequency of inferring. Therefore, frequent dictionary consultation may result in less interaction with the textual context, particularly for some students who are not proficient enough in English or skilled enough in LPS use to take advantage of EDs. For these students, EDs may not necessarily positively influence reading comprehension or word retention. Among the pedagogical implications of these findings is the need for training in the use of EDs in order to help students make the best use of EDs.
Dedicated to my parents
ACKNOWLEDGEMENTS

This dissertation was possible only with the guidance, support, and encouragement of a number of people. I would like to express my sincere gratitude to my committee members, my colleagues, and the instructors who shared their students for this project. Also, I would like to acknowledge my writing tutors, my statistical consultant, and my friends and family.

I would like to thank my adviser, Dr. Keiko Samimy, who has supported me not only with this project but also throughout my doctoral studies. I especially appreciate her insightful suggestions and consistent encouragement, which facilitated this dissertation. I am truly thankful for her prompt attention to my many questions.

I am also indebted to my two other committee members for strengthening this project with their expertise. I would like to thank Dr. Alan Hirvela for his helpful suggestions, especially in the initial stages of this project, and for his steadfast encouragement. I would like to thank Dr. Terence Odlin, particularly for his insightful comments on the drafts of this dissertation.

I would like to thank my colleagues who have provided emotional and intellectual support. I am especially indebted to the members of my study group, who are good friend
of mine: Soonhyang Kim, Masataka Kasai, Dr. Yesim Cetinkaya, and Yuka Kurihara. Their critical comments on the earlier drafts helped improve this dissertation. Also, our weekly meetings motivated me to persevere in wiring this dissertation.

I also would like to thank the two instructors who shared their students for my study, Yuko Fujiwara and Rodney Dunham. I especially appreciate their extensive assistance and hospitality when I was collecting data at their universities.

My appreciation also extends to two tutors at the Writing Center, Justin Pepperney and Kathryn Terzano, for improving the quality of my writing with their helpful suggestions.

I am also grateful to my statistical consultant assigned to me by the Statistical Consulting Service, Yea Kang Yoon, for his long-term support, which he kindly continued to offer me even after he resigned from his position there.

I would like to thank my friend, Tricia Kerr, for emotional support, as well as for formatting this dissertation. I especially appreciate that she was always willing to offer me help even on a short notice when she was busy with her own dissertation.

Finally, I would like to thank my parents and my sister, for emotional and financial support, understanding, and love. Special thanks go to my mother who encouraged me to pursue this degree and constantly expressed her confidence in me.
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CHAPTER 1

INTRODUCTION

Statement of the Problem

Vocabulary is central to second language (L2) acquisition. As McCarthy (1990) states, “without words to express a wider range of meanings, communication in an L2 just cannot happen in any meaningful way” (p. 140). A dictionary is widely recognized as one of the most important tools that help L2 learners understand or learn vocabulary. Many learners are found to depend heavily on dictionaries for their L2 learning. Regardless of learning contexts and individual differences such as age, level of proficiency, and vocabulary size, they draw on dictionaries as primary sources to find information about words (Fan, 2003; Gu & Johnson, 1996; Kobayashi, 2000; Kojic-Sabo & Lightbown, 1999; Schmitt, 1997). Furthermore, many learners not only use them frequently but also perceive them as helpful (Fan, 2003; Kobayashi, 2000; Schmitt, 1997).

However, under the influence of top-down communicative approaches, the prevalent view among researchers and educators is that L2 learners should use dictionaries sparsely (Fraser, 1999b). These researchers and educators emphasize global understanding of discourses and encourage students to infer word meaning by using
contextual cues. They stress the complexity of vocabulary knowledge and argue that words should be incidentally learned while reading or listening, not by studying their short definitions or translations. Encounters with words in a variety of contexts are emphasized because various dimensions of word knowledge are incrementally acquired over a period of time (Schmitt, 2000). Moreover, these researchers and educators are concerned that the frequent consultation of dictionaries interferes with short-term memory and hinders comprehension processes (Knight, 1994).

Despite researchers’ and educators’ concerns, recent research shows that consulting a dictionary is not harmful for L2 acquisition. There is evidence that dictionaries or marginal glosses facilitate not only vocabulary acquisition (Hulstijn, Hollander, & Greidanus, 1996; Knight, 1994; Luppescu & Day, 1993; Watanabe, 1997) but also comprehension of texts (Knight, 1994; Watanabe, 1997). Moreover, consulting a dictionary in combination with inferencing is found to enhance vocabulary learning. Consulting a dictionary to verify an inference maximizes retention of words (Fraser, 1999b; Schouten-van Parreren, 1989), and inferring word meaning before consulting helps L2 learners choose the appropriate meaning from all the meanings listed in the dictionary (Neubach & Cohen, 1988).

Furthermore, researchers point out that contextual guessing does not work well for some contexts, some words, and some learners, and in these instances dictionaries or other direct ways of studying words are required. There is a range of helpfulness in text contexts for inferring word meaning, and some contexts do not provide enough clues for word meaning to be inferred (Beck, McKeown, & McCaslin, 1983, cited in Nation, 2001).
Moreover, some scholars note the difference in acquisition processes between high-frequency and low-frequency words. They argue that whereas high-frequency words can be incidentally learned from context, low-frequency words such as academic words need to be learned through direct study (Nation, 2001; Parry, 1993). Also, individual learners have different styles of learning, and some learners are better at learning vocabulary through explicit study (Sökmen, 1997). The limited value assigned to dictionaries by L2 researchers can explain the relatively little attention given to them in the field (Fraser, 1999b), and there remains more to be found out about how L2 learners use dictionaries and how the use of dictionaries is related to L2 acquisition.

With the exception of a few studies, there is even less research on how consulting a dictionary interacts with other lexical processing strategies (LPSs) (Fraser, 1999a, 1999b; Paribakht & Wesche, 1999), such as inferencing and ignoring, when learners cope with unknown or partially known words. Inferencing has been considered a more effective LPS, and a substantial amount of research has focused on inferencing both in the fields of L1 acquisition and L2 acquisition. However, little research has investigated how inferencing and consulting interact with each other and another LPS, ignoring. Since a learner seems to combine the three LPSs when they encounter unknown or partially known vocabulary in natural contexts (as opposed to experimental situations), it is important to reveal more about how these strategies work together.

Recently, in addition to printed dictionaries (PDs), various types of electronic reference materials have become increasingly available to L2 learners, creating more options for coping with unknown or partially known words. These materials, including
pocket electronic dictionaries (EDs), dictionaries on CD-ROM or floppy disk, online
dictionaries, and concordances, have the potential to enhance L2 learning significantly
with their features such as the ease and speed of look-ups, the quantity of information, a
variety of search roots, and multimedia capacity (Nesi, 1999b). Although more learners
appear to take advantage of these technologies, there is little research on how prevalent
they are among L2 learners, how they use them, and how they are related to L2
vocabulary learning and L2 learning in general.

EDs are becoming one of the most popular electronic materials among L2 learners.
They are especially popular among Asian learners of English from countries such as
Taiwan, Japan, and Hong Kong. For example, Tang (1997) reports that 87% of the
Chinese English as a second language (ESL) students in Vancouver that she surveyed
owned an ED. Whereas learners appear to be excited about EDs’ convenience, many
educators and researchers are concerned about their potentially negative effects on L2
acquisition. They doubt the value of EDs for reasons such as their poor quality and the
possibility of encouraging translation rather than guessing (Odlin, 2001; Tang, 1997;
Taylor & Chan, 1994). Using their intuition or personal experience rather than empirical
evidence, some educators even advocate banning the use of EDs in their classes (Tang,
1997). Whether negative or positive, the new technology with new functions appears to
have impacted the way that students consult a dictionary, although it is not known exactly
what the effects are. Given the popularity of EDs among Asian students, more research is
needed to uncover how EDs impact L2 learning so that educators can provide students
with informed advice.
L2 researchers have not paid much attention to dictionary use; that is, how L2 learners use a dictionary, how dictionary use is related to L2 acquisition, and how dictionary use interacts with other LPSs. Investigating these areas is important especially when L2 learners increasingly depend on new types of reference materials such as EDs.

**Purpose of the Study**

In an attempt to fill in the gaps identified in the previous section, the present study looked into the use of EDs compared with PDs in relation to other LPSs by Japanese learners of English at the college level. It also examined the relationship of students’ use of EDs and PDs with L2 learning. Japanese learners of English were the focus of the study because they are one of the populations, among whom EDs have most widely spread. Specifically, this study addressed the following research questions:

1. How often and for what purposes do Japanese learners of English use EDs compared with PDs?
2. Are there any differences between users of PDs and those of EDs in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?
3. Are there any differences between large-vocabulary and small-vocabulary students in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?
4. Are there any differences between high-reading-ability and low-reading-ability students in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?
5. What is the possible relationship between the use of an ED and a PD and the retention of unknown or partially unknown words?

**Design of the Study**

In order to obtain a more complete picture, this study investigated students’ use of EDs compared with PDs and the relationship between dictionary use and L2 learning, mainly through three investigative techniques: a structured questionnaire, a semi-structured interview, and a retrospective think-aloud technique. Since each of the three techniques has its strengths and weaknesses (Cohen, 1998), this study combined them to highlight their strengths.

A structured questionnaire asking about the use of EDs, PDs, and other LPSs was administered to 279 Japanese university students. Although a written questionnaire can be administered to a large number of students, responses to each item tend to be brief or simplistic (Cohen, 1998). Therefore, semi-structured interviews were conducted with 22 students selected from those who completed the questionnaire, including the users of EDs and those of PDs. The purpose of the semi-structured interviews was to elicit more detailed and broader information from participants based on their responses to the questionnaire. Additionally, retrospective think-aloud protocols were collected from the same 22 students in a reading session, where the students were asked to read a passage, answer comprehension questions, identify unknown words, and report on the LPSs used to deal with the unknown words. A common problem with written questionnaires and interviews is that since these procedures ask learners about the use of dictionaries out of context, they may produce less accurate data (Cohen, 1998). By collecting the think-
aloud protocols at the time that the students were performing the task, this study attempted to lessen this shortcoming. Although a think-aloud technique is controversial due to the potential that it may distort cognitive processes (Cohen, 1998), the use of a think-aloud technique may be justified when data produced through a think-aloud procedure are triangulated with those collected through other techniques. The LPS use revealed by the retrospective think-aloud protocols was compared with word learning assessed by two types of vocabulary tests administered a week later. The data collected through the three procedures were compared with the students’ preferences of dictionary type (ED or PD) indicated by their responses on the questionnaire, their vocabulary size measured by the Vocabulary Levels Test (Schmitt, 2000; Schmitt, Schmitt, & Clapham, 2001), and their reading proficiency indicated by scores on the Reading Comprehension section of the Test of English as a Foreign Language (TOEFL).

This study answered research question 1 through the questionnaire and the interviews. Research questions 2, 3, and 4 were answered through the questionnaire, the interviews, and the retrospective think-aloud protocols. Research question 5 was answered through the two types of vocabulary tests administered a week after the reading session.

**Significance of the Study**

The present study significantly benefits researchers and educators in the field of L2 acquisition. Since dictionary use has not been researched extensively, we know relatively little about how learners use dictionaries and how dictionary use is related to vocabulary learning. Given the evidence that L2 learners heavily depend on dictionaries
(Fan, 2003; Gu & Johnson, 1996; Kobayashi, 2000; Kojic-Sabo & Lightbown, 1999; Schmitt, 1997), it is necessary to discover more about dictionary use. This is particularly the case when L2 learners are increasingly taking advantage of new technologies, probably modifying their ways of consulting dictionaries to accommodate the new technologies. EDs are one of the new technologies that are becoming popular among L2 learners and will spread more widely in the future as they advance technologically and pedagogically. This study investigating the use of EDs not only contributes to an increase in the understanding of L2 learners’ use of dictionaries, but also helps the understanding of how technologies impact dictionary use.

This study also has significant pedagogical implications. Despite their importance for L2 learning, dictionary skills are not taught in many classrooms and are left to individual learners. Whatever instruction teachers provide on dictionary use is based on personal experiences or intuition. This is partially because there has been little empirical research on dictionary use on which teachers can base their instruction. The findings from this study inform teachers about students’ dictionary use and improve the ways that they train their students in dictionary skills. For example, this study helps teachers decide whether EDs are indeed detrimental to L2 learning and if they should prohibit their students from using them. Furthermore, this study also examines how students use dictionaries in relation to other LPSs, and how the combined use of the three LPSs is related to vocabulary acquisition. Therefore, this study helps the understanding of not only when to consult a dictionary, but also when to turn to other LPSs without consulting a dictionary. This knowledge helps teachers improve instruction on how to use a
dictionary selectively without looking up all unknown words. Finally, since this study involved Japanese students of different genders, levels of proficiency, and fields of study, the findings are also useful for teachers working with other students in similar contexts who share some backgrounds with the participants of the study.

**Definitions of Terms**

*Concordance* – An index of all the occurrences of a particular word in a text or a collection of texts either in an electronic form or hardcopy.

*Consulting* – One of the LPSs; the strategy of finding out the meanings of unknown words by consulting a dictionary or another individual.

*Contextual guessing* – Synonymous with inferencing; one of the LPSs; inferring the meanings of unknown words from the surrounding words in a text, using both linguistic and extralinguistic cues. Various types of knowledge, such as syntactic knowledge, morphological knowledge, semantic knowledge, world knowledge, and strategic knowledge, contribute to contextual guessing.

*Direct vocabulary teaching/learning* – Deliberate learning and teaching of aspects of vocabulary knowledge, typically through various vocabulary exercises or list learning.

*Explicit vocabulary teaching/learning* – Learning and teaching of aspects of vocabulary knowledge with conscious operations or awareness at the point of learning.

*Ignoring* – One of the LPSs; the strategy of not attending to unknown words.

*Implicit vocabulary learning* – Learning of vocabulary without conscious operations or awareness at the point of learning, typically from reading or listening while the learner’s main focus is on the message of the texts.
*Incidental vocabulary learning* – Learning of vocabulary from reading or listening while the learner’s main focus is on the message of the texts.

*Inferencing* – Synonymous with contextual guessing; one of the LPSs; the strategy of inferring the meanings of unknown words from the surrounding words in a text, using linguistic cues and background knowledge.

*Lexical processing strategies (LPSs)* – Three strategies available to a learner when confronting an unfamiliar word. They include ignoring, consulting, and inferencing.

*Monolingual learners’ dictionaries* – Monolingual dictionaries specifically designed for L2 learners such as the *Collins COBUILD English Language Dictionary* and the *Longman Dictionary of Contemporary English*. This type of dictionary uses only low-frequency words for definitions and contains word information relevant to a learner such as pronunciation, grammatical behavior, and collocations.

*Users of pocket electronic dictionaries (EDs)* – Students who report using an ED more often than a PD.

*Users of printed dictionaries (PDs)* – Students who report using a PD as often or more often than an ED.

*Vocabulary learning strategies* – Strategies used to discover information about words or consolidate the information. The use of vocabulary learning strategies is conscious at the initial stage of learning, but later it may become automatic and unconscious.
**Word knowledge** – Knowing a set of features of a word, including orthographical and phonological forms, meanings, grammatical behavior, associations, collocations, frequency, and register. There are different degrees of word knowledge.

**Assumptions**

1. All literate L2 learners more or less depend on a dictionary to discover information about words.
2. A word has abstract meanings, such as those appearing in a dictionary, which are independent from the context in which it is used.
3. Students are capable of reporting their use of dictionaries through a written questionnaire, interviews, and a retrospective think-aloud procedure.
4. A think-aloud technique does not alter students’ use of dictionaries.
5. Students use LPSs during the reading session as they usually do.
6. The Vocabulary Levels Test and the Reading Comprehension Section of the TOEFL are valid and reliable measures to assess students’ vocabulary size and reading ability, respectively.
7. The two types of vocabulary tests administered after the reading session (i.e., multiple-choice and open-ended tests) can sufficiently access students’ vocabulary acquisition during the reading session.

**Limitations of the Study**

1. This study focused on LPSs used by learners to deal with (either discover information about or ignore) unknown or partially known words. It did not examine
vocabulary learning strategies used for consolidating information about words once the information is discovered.

2. This study did not assess overall English proficiency of participants using the same measure, although it assessed their vocabulary size and reading ability using the Vocabulary Levels Test and the Reading Comprehension section of the TOEFL.

3. The participants of this study were not randomly selected. Their LPS use may not have been typical of Japanese college students.

4. The students who participated in the second phase of the study were selected from those who indicated their willingness to participate in it. Their LPS use may not have truly represented the original sample.

5. This study examined only Japanese college students studying in English as a foreign language (EFL) contexts. Other learners of English with different backgrounds (different ages, cultural backgrounds, learning contexts, etc.) may exhibit different patterns of dictionary use.

6. This study may have been unable to examine LPSs employed unconsciously because data were collected through students’ self-reports (by means of a written questionnaire, interviews, and retrospective think-aloud protocols).

7. This study operationally divided students into users of EDs and those of PDs based on their relative frequency of using both types of dictionaries. However, in reality, students’ use of dictionaries may be more complex; that is, the same students may use both types of dictionaries with different frequency in different contexts.
8. The vocabulary tests used in this study (i.e., the Vocabulary Levels Test and the two types of vocabulary tests administered after the reading session) only assess learners’ knowledge of word meanings by asking them either to match word forms with definitions or supply definitions for words. They do not assess learners’ knowledge of other aspects of word knowledge.

9. This study examined learners’ use of dictionaries and the relationship between their use of dictionaries and vocabulary acquisition only cross-sectionally. It did not study how learners’ dictionary skills develop and their vocabulary knowledge increases over a period of time.

10. The two types of vocabulary tests were administered only a week after the reading session. This study did not administer another set of vocabulary tests a few weeks after the session in order to examine how words were retained over a longer period of time.
CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The use of dictionaries has been of relatively little interest for L2 researchers and educators, and the negative view of dictionaries among these L2 specialists appears to explain partially this neglect. Many researchers and educators frown on the use of dictionaries because they believe that it encourages L2 learners to pay too much attention to individual words at the expense of comprehensive understanding of texts. Moreover, consulting a dictionary is believed by many to slow down reading and discourage L2 learners from reading as much as possible.

Under the influence of the top-down communicative approaches of the 1970s and 1980s, current dominant perspectives on vocabulary instruction emphasize implicit, naturalistic methods for learning vocabulary (Sökmen, 1997). Many L2 researchers and educators believe that guessing word meaning from context while reading is the most effective way of learning unknown vocabulary. They advise L2 learners to avoid consulting a dictionary frequently, using it only as a last resort. Consulting a dictionary is perceived as interfering with the comprehension process (e.g., Knight, 1994). Exposure to a word in a variety of contexts is regarded as crucial for understanding the depth of the word’s meaning (Sökmen, 1997).
Recently, a growing body of research points to the limitations of depending solely on implicit vocabulary acquisition (Hulstijn et al., 1996; Knight, 1994; Paribakht & Wesche, 1993; Zimmerman, 1997). It has been found that vocabulary is learned the most effectively when implicit learning is combined with explicit learning. The limitations of implicit learning have renewed several scholars’ interests in explicit vocabulary learning techniques such as consulting dictionaries. Recent studies suggest that the use of dictionaries or marginal glosses facilitates not only vocabulary learning but also comprehension of texts (Knight, 1994). Moreover, regardless of scholars’ and teachers’ discouragement, L2 learners continue to depend heavily on dictionaries (Kobayashi, 2000; Schmitt, 1997). Learners are found not only to use dictionaries frequently but also to perceive them as helpful. The scholars who are interested in dictionary use do not consider it a practice that always should be encouraged. They emphasize consulting a dictionary selectively by balancing dictionary use with other lexical processing strategies (LPSs), such as guessing word meaning from context and ignoring a word (Fraser, 1999b; Scholfield, 1997; Tang, 1997).

The use of dictionaries has drawn relatively little attention from researchers in the field of L2 acquisition (Scholfield, 1997). The studies that have been conducted in this area are not only few in number but also methodologically and thematically limited. A small body of studies investigated learners’ general patterns of dictionary use through a survey (Baxter, 1980; Béjoint, 1981; Tomaszczyk, 1979). More recent studies focused on learners’ use of dictionaries or glosses and the relationship of dictionary use with learning outcomes while learners were engaged in a particular task that often involved reading (Hulstijn et al., 1996; Knight, 1994; Laufer & Hill, 2000; Luppescu & Day, 1993;
Watanabe, 1997). The majority of these studies used experimental designs in which an experimental group with a dictionary was compared with a control group without a dictionary, or in which experimental groups with different types of dictionaries were compared with each other. Although many studies focused on reading, some studies examined the use of dictionaries while learners were engaged in writing (Harvey & Yuill, 1997; Laufer & Hadar, 1997).

In addition to the above studies that focus on the use of dictionaries, several studies on general vocabulary learning strategies provide insights into L2 learners’ use of dictionaries (Fan, 2003; Fraser, 1999a, 1999b; Gu & Johnson, 1996; Kobayashi, 2000; Kojic-Sabo & Lightbown, 1999; Parry, 1991, 1993, 1997; Schmitt, 1997). These studies dealt with dictionary use as one of the vocabulary learning strategies and examined the roles that dictionary use plays in vocabulary learning along with other strategies.

Literature on L2 vocabulary acquisition, as well as literature on the relationship between L2 vocabulary acquisition and reading, provides the foundation to understand L2 learners’ use of dictionaries. Therefore, literature on L2 vocabulary acquisition is first discussed, focusing on the controversy regarding L2 vocabulary acquisition. Then, the literature on the relationship between L2 reading and vocabulary acquisition is reviewed, followed by a discussion of studies on vocabulary learning strategies. Next, the literature on dictionaries is discussed in the order of dictionary typologies, the scene of English Monolingual learners’ dictionaries, the scene of English-Japanese/Japanese-English dictionaries, and the scene of handheld electronic dictionaries (EDs) in Japan. Finally, the studies on dictionary use are discussed, considering first, those on general dictionary use;
second, those on dictionary use while reading; third, those on dictionary use while writing; and fourth, those comparing EDs and printed dictionaries (PDs).

**Controversy over L2 Vocabulary Acquisition**

Perspectives on L2 vocabulary acquisition range from implicit, naturalistic positions to those that support explicit instruction (Ellis, 1995). Scholars who support implicit vocabulary acquisition hold that the learning of vocabulary occurs when a learner reads or listens to a language while the main focus of the learner’s attention is on the message of the text (Nation, 2001). In these scholars’ perspectives, the reader or listener is able to recognize contextual cues and guess the meanings of unknown words without being given their definitions. On the other hand, scholars who advocate explicit learning hold that conscious study facilitates the learning of new vocabulary. Many researchers currently take the former position in support of implicit vocabulary learning.

The major argument of scholars who take the implicit position is that there are too many words to learn. This argument primarily comes from L1 vocabulary acquisition research. Studies have shown how few words are taught by direct instruction compared to how many words native speakers know. Native speakers know tens of thousands of word families (a group of words consisting of a headword, its inflected forms, and its closely related derived forms). Including multiple meanings, idioms, and irregular derivations, the size of native speakers’ vocabulary is astronomical. On the other hand, even the most ambitious vocabulary learning programs in L1 do not teach more than a few hundred words per year (Nagy & Anderson, 1984, cited in Hatch & Brown, 1995). The gap between what is taught and what is known is explained by incidental learning.
Furthermore, there is a lot to learn about a word. Word knowledge consists of multiple dimensions (Nagy & Schott, 2000). Richards (1976) notes that word knowledge includes its orthographical and phonological forms, meanings, grammatical behaviors, associations (the semantic relations that the word has with other words), collocations (words that the word typically occurs with), frequency, and register. Similarly, Nation (1990) distinguishes eight aspects of word knowledge: knowledge of the word’s spoken form, written form, grammatical behavior, and collocational behavior, frequency, stylistic register, conceptual meaning, and associations with other words. Moreover, word learning takes place in many steps (Nagy & Schott, 2000). Schmitt (2000) notes that receptive knowledge (knowledge needed for understanding the word while listening and reading) tends to precede productive knowledge (knowledge needed for using the word while speaking and writing). Paribakht and Wesche (1997) offer five stages of word learning: (1) never saw it before; (2) heard it but doesn’t know what it means; (3) recognizes it in context; (4) knows it well; and (5) can use it in a sentence. Since there is so much to learn about a word, one encounter with the word is not sufficient. As a learner meets a word in a variety of contexts, a more accurate understanding of its meaning and use gradually develops. Therefore, multiple exposures to a word are essential for complete acquisition.

However, some caution is needed when applying the above arguments, which are mainly based on the L1 vocabulary acquisition process, to the L2 vocabulary learning process. Nation (2001) lists differences between native speakers and L2 learners. First, L2 learners begin to study English knowing very few words, whereas native speakers are
likely to know around 5,000 high-frequency word families at the age of five. In order to
guess a correct meaning from contexts, a majority of surrounding words must be known.
Incidental vocabulary learning does not take place as successfully for L2 learners with
insufficient vocabulary knowledge. Secondly, language learners, especially those in the
EFL context, receive limited input, whereas native speakers are typically exposed to a
million words per day (Simpson, 1988, cited in McCarthy & Carter, 1997). Thirdly, L2
learners have less time for learning. They usually begin their study about the age of
twelve and receive around five hours of instruction per week in the subsequent years.
Research shows that incidental learning is a slow and unreliable process (Nation, 2001).
L2 learners, for whom limited time and input are available, cannot depend solely on
incidental learning.

Taking into account these differences between L1 and L2 vocabulary learning, the
over-reliance on implicit learning is not effective for L2 learners. Therefore, conscious
vocabulary study should accompany implicit learning for them, as a way of speeding up
the learning process. The limitations of implicit learning clearly indicate that the use of
dictionaries should be encouraged as one of the explicit techniques for word learning,
although it should be carefully balanced with incidental learning from context.

**Reading and Vocabulary Acquisition**

Vocabulary knowledge and reading are closely related to each other, and the
relation is not one-directional (Nation, 2001). Vocabulary is a crucial component of
reading ability, and reading can contribute to vocabulary growth.
Students need to know enough words to read well. Researchers have been interested in whether there is a language threshold that a reader must cross for comprehension to occur. Nation (1990, 2001) claims that approximately 2,000 most frequent word families enable learners to understand 85% of words in most text. He argues that this core vocabulary should be directly taught so that students can master it at the early state of language learning. However, 85% coverage is not enough for comprehension. Laufer (1992) found that general comprehension requires 95% coverage, and knowledge of at least 3,000 word families is needed to achieve this coverage level. She concludes that the 3,000 word family level is the vocabulary threshold. Researchers seem to agree that at least 98% coverage is required for full comprehension (Laufer, 1992; Nation, 2001), and for this coverage, the reader should have knowledge of about 5,000 word families (Huckin & Coady, 1999). Academically oriented students may need larger vocabulary. Hazenburg and Hulstijn (1997, cited in Huckin & Coady, 1999) claim that a minimum of 10,000 word families is needed for university studies.

The findings of studies on incidental learning do not show large amounts of vocabulary learning. Nation’s (1990, 2001) survey of studies with L1 readers concludes that there is between a 1 and 10 and 1 in 20 chance of an unfamiliar word being learned to some degree after one encounter, and that 5 to 16 exposures are needed for full acquisition of a word. Since it is a slow and unpredictable process, multiple exposures to a word in a variety of contexts are extremely important for incidental vocabulary learning.

However, small amounts of incidental vocabulary learning do occur from reading, and small amounts become large when learners read extensively (Nation, 2001).
Researchers widely agree that much vocabulary learning occurs incidentally while reading extensively via guessing from context (Huckin & Coady, 1999). There is also evidence that L2 learners incidentally acquire vocabulary through reading (e.g., Chun & Plass, 1996; Fraser, 1999a; Hulstijn, 1992; Hulstijn, Hollander, et al., 1996; Knight, 1994; Krashen, 1989; Paribakht & Wesche, 1997, 1999).

Vocabulary can be learned through both intensive reading (reading with attention to the vocabulary, grammar, and discourse of the text, as well as the meaning of the text) and extensive reading (reading with a focus on the meaning of the text without additional language use) (Nation, 2001). Intensive reading is generally a more efficient way for learning vocabulary. Studies show that a deliberate focus on vocabulary leads to greater vocabulary growth than incidental learning (e.g., Paribakht & Wesche, 1993).

Many studies have been conducted on vocabulary learning through reading in the past decade. Most of them used concurrent or retrospective think-aloud methods or experiments. They addressed issues such as how word learning happens, what variables affect word learning, how much learning occurs, and whether instruction on word-guessing strategies is effective. Although vocabulary learning through reading is not fully understood, these studies have revealed its mechanism, as shown below.

Hulstijn (1992) investigated the incidental learning of L1 pseudo words and L2 rare words from a single encounter in a 900-word text, in a series of experiments with Dutch native speakers or learners of Dutch. The meaning-to-be-inferred procedures (multiple choice and no cue) were compared with the meaning-given procedure (translation/synonym). The retention rate was lowest in the no-cue condition (18.3% for
native speakers and 7.5% for nonnative speakers), and the no-cue group inferred incorrect meanings of unknown words most often. The multiple-choice group retained more words than the translation/synonym group. However, the non-native speakers in the multiple-choice group also made a high percentage of wrong guesses.

Parry (1991, 1993, 1997) addressed the question of how ESL students acquire specialized and non-specialized words required for their content courses through a series of longitudinal case studies. Selected ESL students were asked to record every word in their anthropology textbooks that caused them “difficulty” throughout the semesters. They were also asked to gloss what they guessed the word’s meaning to be.

The findings of a case study of a Japanese student called Yuko (Parry, 1993) show that she was able to guess a large portion (89%) of words that she recorded. Furthermore, she achieved a high degree of success in her guesses. Out of 148 glosses, 33% were judged as correct and 36% as partially correct. Only 20% of glosses were judged as incorrect. However, she demonstrated serious problems with determining syntagmatic relations between words and the morphological structures of words. This study suggests that adult L2 learners, even those of limited proficiency like Yuko, can guess word meanings from context with the aid of their knowledge and experience as adults and the varied contexts in which vocabulary is encountered throughout their academic courses.

Parry (1991, 1997) asked a Greek Cypriot student called Dimitri and a Korean student called Ae Young, to make a list of difficult words encountered in the anthropology textbook, and in addition, to read another text and make a similar list,
thinking aloud. The findings of their case studies show that Dimitri and Ae Young had quite different strategies. Dimitri’s style was holistic. Dimitri read the whole text through rapidly, stopping only to mark unfamiliar words. Then he read through the passage again, in order to write down each word and guess its meaning. On the other hand, Ae Young was analytic. She read the text only once, stopping at each unfamiliar word. In each case, she spent a long time looking at the word and the context. Ae Young’s analytical style appeared to explain why she recorded a higher portion of unknown words throughout the quarter; since she read very little slowly, she had been exposed to a small vocabulary. In contrast, Dimitri’s holistic style appeared to explain why he remembered fewer new words and lacked a precise understanding of the text. Parry concludes that it is important to develop the flexibility of using analytic and holistic styles for different types of words.

Fraser (1999a) investigated the use of LPSs by ESL students while reading and the effects of strategy use on vocabulary learning through a retrospective think-aloud method. Fraser also looked at the impact of instruction on students’ use of LPSs. Fraser found that students inferred more frequently (55% of total encounters with unfamiliar words) than consulted (39%) or ignored (35%). They were generally successful in determining the word meaning when consulting or inferencing; 78% of consults and 52% of inferences resulted in full comprehension and another 20% of inferences resulted in partial comprehension. The rate of ignoring decreased and the rate of success in making inferences increased over time, suggesting the effectiveness of instruction. When students consulted or inferred alone, they recalled the word meaning that they had determined about 30% of the time (30% and 31%, respectively). However, when they inferred and
then consulted, they had a higher retention rate (50%). There were individual differences in word retention scores (13% - 40%). This study suggests that consulting a dictionary is useful both for determining word meaning and for vocabulary learning.

Paribakht and Wesche (1999) examined the strategies and the kinds of knowledge and information L2 learners used when dealing with unknown words they encountered while reading. Concurrent and retrospective think-aloud data were collected from the 10 university ESL students while reading a text and completing two types of comprehension tasks (summary and question tasks). The participants ignored a large portion of the words (56% for the summary task, 52% for the question task). For those words they attended to, inferencing was the most commonly used strategy. Sentence-level grammatical knowledge was the type of knowledge most often used in lexical inferencing, followed by word morphology, punctuation, and world knowledge. Individual differences were found in the patterns of strategies and knowledge sources they used.

Huckin and Bloch (1993) explored the strategies used by three intermediate-proficiency Chinese graduate students when they encountered unknown words in their readings. The students were asked to translate the texts into Chinese while thinking aloud. Huckin and Bloch found that they made 25 successful guesses out of 44 cases, and that in doing so, they relied mainly on immediate contexts (16 cases). The most common case of unsuccessful guessing was an instance of “mistaken ID,” where the students mistook the word for another word that resembled it, thought they knew it, and failed to use context clues.
Unlike the other studies, Gu focuses on intensive reading. Gu (2003) examined how two successful learners of English at a Chinese university handled vocabulary during and after reading. The two learners, Chi Wei and Chen Hua, participated in a think-aloud session where they read a short text and then memorized new words appearing in the text. They were also interviewed on their general vocabulary learning strategies. Gu found that Chi Wei and Chen Hua demonstrated striking differences in vocabulary learning. Chi Wei focused on details in the textbook, paying attention to many new words, whereas Chen Hua aimed at overall understanding of the text, focusing only on new words that she found important or interesting. Chi Wei spent much time on learning during and after reading because intensive reading had been his main source of English input. In contrast, Chen Hua spent less time on intensive reading and spent more time on extensive reading outside of the curriculum. However, the two learners also demonstrated similarities. They both had high levels of self-motivation and selective attention. Also, both of them employed a wider range of vocabulary learning strategies, used a dictionary for both comprehension and vocabulary-learning purposes, engaged in frequent contextual inferencing, and spent time on memorizing word lists. This study shows that there are different ways to succeed in learning English. Moreover, vocabulary learning strategies such as memorization and repetition that are criticized in Western cultures can be useful in different learning contexts such as Asian cultures.

To summarize, the literature on vocabulary learning through reading demonstrates that L2 learners are able to learn vocabulary incidentally while guessing at the meanings of unknown words from context. However, guessing from context has many limitations.
First of all, acquiring vocabulary mainly through guessing from context is a very slow process. Second, guessing is imprecise or erroneous. Third, guessing is effective only when most of the surrounding words are known. Fourth, guessing takes time and slows down reading. Fifth, too much emphasis on guessing from context ignores the fact that individual learners have different styles. Sixth, guessing from context does not necessarily result in long-term retention. These limitations indicate the need to complement guessing from context with explicit approaches to vocabulary learning, such as dictionary consultation and learning of word lists.

**Studies on Vocabulary Learning Strategies**

Studies on vocabulary learning strategies consider dictionary use one of the most important vocabulary learning strategies and uncover what roles dictionaries play in L2 vocabulary learning and general L2 learning in combination with other strategies.

Vocabulary learning strategies is a new area. Although vocabulary learning strategies have been investigated in studies on general language learning strategies, there have been very few studies focusing specifically on vocabulary learning strategies until recently (Schmitt, 1997). Some studies on vocabulary learning strategies have examined individual strategies, such as guessing from context and mnemonics like the keyword method. However, few studies have looked at vocabulary learning strategies as a group (Schmitt, 1997).

Studies on vocabulary learning strategies have significant pedagogical implications. According to Nation (2001), knowledge and skills in vocabulary learning strategies are important, especially when dealing with low-frequency words. High
frequency words are so essential that they should be taught explicitly. However, low frequency words are not encountered often enough to merit teaching time. Therefore, instructors should teach students strategies to help them deal with these low frequency words.

Since it is still in an “embryonic” state, the area of vocabulary learning strategies lacks a comprehensive list or taxonomy (Schmitt, 1997). To address this gap, Schmitt (1997) attempted to develop the taxonomy of vocabulary learning strategies, which contains 58 strategies in total. Drawing on Oxford’s (1990) categories of language learning strategies, Schmitt classified vocabulary learning strategies into four groups: social strategies, memory strategies, cognitive strategies, and metacognitive strategies. In addition to these categories, he created a new category, determination strategies, which are vocabulary-specific. Determination strategies are those “used by an individual when faced with discovering a new word’s meaning without recourse to another person’s expertise” (p. 205). Determination strategies include strategies such as guessing from context, guessing from a L1 cognate, and consulting a reference material. Furthermore, Schmitt distinguished discovery strategies (strategies useful for the initial discovery of a word’s meaning) and consolidation strategies (strategies useful for remembering that word once it has been introduced). When encountering an unknown word, learners need to figure out the meaning by using discovery strategies such as consulting a dictionary and asking someone. Once learners have discovered the meaning, they may need to remember it by using consolidation strategies such as mnemonics and list learning.
Nation (2001) also developed a taxonomy of vocabulary learning strategies. He divided vocabulary learning strategies into three groups: planning, sources, and processes. Planning strategies involve deciding on where to focus attention and how to focus the attention. Source strategies involve finding information about words. Process strategies involve remembering vocabulary and making it available for later use. Whereas Schmitt’s taxonomy classifies dictionary as a determination and discovery strategy, Nation’s taxonomy categorizes it as a source strategy.

Studies on vocabulary learning strategies as a group have identified various vocabulary learning strategies, including those not in Schmitt’s taxonomy. Furthermore, some studies revealed how the use of strategies relates to success in vocabulary learning (Fan, 2003; Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Lawson & Hogben, 1996). Many studies in this area used a written questionnaire. Other studies used interviews (Sanaoui, 1995), journals (Sanaoui, 1995), or a think-aloud procedure (Lawson & Hogben, 1996). Whereas some studies focused on strategy use in a particular task (Lawson & Hogben, 1996), many studies examined strategy use in various contexts in and outside the classroom.

Sanaoui (1995) investigated how adult L2 learners approached vocabulary learning through four case studies of ESL learners and eight case studies of French as a second language (FSL) learners. Sanaoui identified two approaches to vocabulary learning. The two approaches differed in five aspects: (a) the extent to which learners engaged in independent study, (b) the range of self-initiated learning activities, (c) the extent to which learners recorded vocabulary items they were learning, (d) the extent to
which learners reviewed such records, and (e) the extent to which they practiced vocabulary items outside their course. A different study conducted by the same researcher (Sanaoui, 1992) shows that learners who adopted a structured approach were more successful in retaining vocabulary than those who had an unstructured approach.

Gu and Johnson (1996) examined the vocabulary learning strategies and beliefs of 850 Chinese learners of English and their impacts on vocabulary size and general English proficiency. Students’ responses to the questionnaire on approaches to vocabulary learning were correlated with their scores on two vocabulary size tests and composite scores of English proficiency. Gu and Johnson found that contrary to popular images of Asian students, participants did not depend heavily on memorization; instead, they used a variety of vocabulary learning strategies. Multiple regression analyses indicated that two metacognitive strategies, self-initiation and selective attention, were positive predictors of general proficiency and vocabulary size. Contextual guessing, skillful use of dictionaries, note-taking, paying attention to word formation, contextual encoding, and activation of newly learned words positively correlated with the two dependent variables. On the other hand, visual repetition of new words was a negative predictor of both variables. Strategies aimed at word retention, such as semantic encoding and list learning, correlated with vocabulary size but not with general English proficiency. Finally, a cluster analysis identified five approaches to vocabulary learning. Whereas one small group excelled in vocabulary size and general proficiency through extensive reading, another group succeeded by actively employing a wide range of strategies. The least
successful group strongly believed in memorization and depended heavily on visual repetition of new words.

Lawson and Hogben (1996) focused on the vocabulary learning strategies used by 15 Australian university students while learning the meanings of new Italian words. Students participated in a think-aloud session, where they learned 12 nouns using index cards created by the researchers, verbalizing their thoughts. Lawson and Hogben found that the most frequently used strategies involved some form of repetition of the new words and their meanings. Students did not frequently analyze the grammatical features of the words such as suffixes, nor did they widely use the physical features and sounds of the words. Furthermore, they infrequently employed elaborative strategies that involve extensive transformation of the word/meaning complex, such as paraphrasing and mnemonic strategies. High-scoring students not only used many more strategies, including simple rehearsal, but also used these strategies more frequently. In contrast, low-scoring students exhibited limited and inconsistent strategy use.

Kojic-Sabo and Lightbown (1999) examined 47 ESL and 43 EFL students’ approaches to vocabulary learning and the relationship between strategy use and achievement. They completed a questionnaire, adapted from Sanaoui (1992), which required them to indicate their approaches to vocabulary learning in terms of: (a) time, (b) independence, (c) note taking, (d) review, and (e) dictionary use. Also, they completed a vocabulary test assessing vocabulary size and a cloze test assessing overall English proficiency. Kojic-Sabo and Lightbown found that ESL and EFL students exhibited both similarities and differences. Whereas ESL students engaged in
independent learning activities outside the classroom to a greater extent, EFL students engaged in a greater variety of direct, vocabulary-targeted activities and reviewed new words more frequently. Both ESL and EFL students used a dictionary frequently and with sophistication. A cluster analysis identified eight different profiles of approaches to lexical learning. More frequent and elaborate strategy use was linked to higher levels of vocabulary knowledge and overall English proficiency. In particular, learner independence and time spent on language learning were closely related to high achievement, regardless of learning environments.

Schmitt (1997) examined the use of vocabulary learning strategies by 600 Japanese EFL learners. They completed a questionnaire requiring them to indicate the frequency of use and the perceived helpfulness for each of 41 vocabulary learning strategies. The results show that Japanese students most frequently used strategies such as consulting a bilingual dictionary, guessing from context, and asking classmates for meaning, repetition of a word’s verbal or written form, studying the spelling, and saying the new word aloud. On the other hand, they least frequently used other strategies, such as having the teacher check flash cards, semantic mapping, using cognates, using physical actions, and the keyword method. In most cases, students were using the strategies they thought useful. For example, consulting a bilingual dictionary was not only used the most frequently but also perceived as the most helpful out of 41 strategies. However, some strategies, such as studying synonyms and antonyms, continuing to study over time, and asking the teacher for a paraphrase, were used less frequently although the
students perceived these strategies as helpful. This study shows that Japanese students tend to rely heavily on traditional strategies, such as the use of a bilingual dictionary.

Kobayashi (2000) partially replicated Schmitt’s (1997) study, using 40 Japanese students in the US. Half of students studied English at three intensive English programs, and the other half studied various disciplines at a university. The comparisons were made between the two groups within the study and between the subjects of this study and Schmitt’s subjects. The results show that while there was a high degree of similarity among all Japanese students (EFL students, ESL English students, and ESL academic students), there were also structured differences among the lines of experience in the language and length of residence in the US. All Japanese students most frequently used strategies such as consulting a bilingual dictionary, guessing from context, verbal repetition, and saying a new word aloud. In particular, consulting a bilingual dictionary was the most frequently used by all groups. In contrast, all groups less frequently used other strategies, such as having teacher check flash cards, the keyword method, and using physical actions. As students stayed longer in the US and away from language instruction, their strategies seemed to shift from those focusing on vocabulary learning itself to those involving natural contexts, which confirms the findings of Kojic-Sabo and Lightbown’s (1999) study.

Like Schmitt’s EFL students, the ESL Japanese students of this study used the strategies they believed useful in most cases. However, there were some discrepancies. For example, students infrequently used some strategies, such as consulting a monolingual dictionary and interacting with native speakers, although they perceived
them as helpful. In contrast, they frequently used such strategies as guessing from context and skipping or pass new word, even though they did not perceived them as helpful.

Fan (2003) examined the use of vocabulary learning strategies by 1,067 Hong Kong Chinese students in order to look at the relationship among the frequency of use, the perceived usefulness, and the actual usefulness of strategies. The students completed a vocabulary learning strategies questionnaire and a vocabulary test. The results show that Hong Kong students least frequently used memorization strategies, such as repetition, association, and grouping. They most frequently used strategies for reviewing known words and dictionary strategies. There were some discrepancies between frequency of use and perceived usefulness. They used guessing strategies more frequently, although they perceived consulting a dictionary as more useful. In contrast, although they perceived management strategies as helpful, they seldom used them. Students who were more proficient in English vocabulary used a wider range of strategies more often than the less proficient students. In particular, they used sources, guessing, dictionary, and known words strategies more often than the less proficient students. The more proficient students often used both guessing and dictionary strategies, suggesting that both guessing and dictionary strategies are important for vocabulary learning. In contrast, the less proficient students used repetition and association strategies more often than the more proficient groups.

These studies examining vocabulary learning strategies illustrate that success in vocabulary learning depends on the effective management of a wider repertoire of strategies, not the use of any single strategy. Successful learners have a variety of
strategies and manage them actively. They are independent and actively engage in vocabulary learning not only in the classroom but also outside the classroom. Dictionaries, however, were frequently used both by successful learners and less successful learners. The next section discusses this important learning tool, the dictionary.

**Literature on Dictionaries**

**Types of Dictionaries**

The dictionary, the prototypical work of lexical reference, classifies and stores information on words, phrases, and other lexical items, including their form, meaning, use, origin, and history (Kirkness, 2004). It is one of the oldest and the most widespread books in literate societies, and the number of its titles is enormous (Kirkness, 2004). Different societies have different lexicographical traditions and have produced dictionaries of various kinds for multiple reasons (Béjoint, 2000). In addition, many references are now appearing not only in print format but also in electronic formats, such as floppy disk, CD-ROM, online, and handheld devices. There is a wide range of dictionaries with different languages, varieties, vocabularies, sizes, formats, prices, intended purposes, and users.

Over the last thirty years, many researchers have attempted to classify the variety of dictionary types and have reached the same conclusion that the task is impossible (Béjoint, 2000; Hartmann, 2001; Kirkness, 2004). Although there is no agreed taxonomy applicable to all types of dictionaries, several broad distinctions are found to be practically useful (Béjoint, 2000; Hartmann, 2001; Kirkness, 2004). For example, Kirkness (2004) discusses distinctions such as monolingual and multilingual dictionaries,
passive and receptive dictionaries, generalized and specialized dictionaries, native speakers’ and non-native speakers’ dictionaries, and dictionaries for adults and dictionaries for children. Similarly, Béjoint (2000) lists distinctions such as general and specialized dictionaries, monolingual and bilingual dictionaries, encyclopedic and language dictionaries, foreign learners’ and native speakers’ dictionaries, and dictionaries for adults and dictionaries for children.

Of this variety of dictionary types, the following sections focus on English monolingual learners’ dictionaries and English-Japanese/Japanese-English dictionaries, which are important for Japanese learners of English at the college level.

**The Scene of English Monolingual Learners’ Dictionaries**

The first English monolingual learners’ dictionary, or MLD, the *New Method English Dictionary*, appeared in 1935. Although its arrival was not recognized outside of the ESL/EFL circles in the world of lexicography, this type of dictionary eventually turned out to be important in the development of lexicography; some of their features are now being incorporated back into native-speaker dictionaries, such as the *New Oxford Dictionary of English* (1981) (Béjoint, 2000). The expansion in the industry of teaching English as a foreign language throughout the world since World War II has created the highly profitable market for MLDs (Béjoint, 2000). For more than half a century, the field of pedagogical lexicography for learners of English has been marked by “rapid and constant change, technological advance, innovative and creative development, and responses to users’ needs and to teachers’ and metalexicographers’ suggestions and demands, and an increasingly competitive market” (Kirkness, 2004). Recently, different
English-speaking countries, such as Australia and the US, have produced their own MLDs, but the center for the market of English MLDs has been and remains Great Britain (Kirkness, 2004).

The four British MLDs for advanced learners have dominated the market worldwide: the *Oxford Advanced Learner’s Dictionary of Current English (OALD)*, the *Longman Dictionary of Contemporary English (LDOCE)*, the *Collins COBUILD English Dictionary (CCED)*, and the *Cambridge International Dictionary of English (CIDE)*. The MLDs work on the same principles, that is, “the need to limit the word list to only the most important words, but to treat them more fully, with pronunciation indicated through phonetic transcription, with grammatical information, explanation of idioms and use of examples, and meaning conveyed in simple terms” (Béjoint, 2000, p. 66).

Oxford University Press first published the *OALD* in Japan in 1942 under the title of the *Idiomatic and Syntactic English Dictionary*, edited by A. S. Hornby with E. V. Gatenby and H. Wakefield. It was republished as the *OALD* in 1963, 1974, 1980, 1989, 1995, and 2000. This dictionary established some of the features of MLDs as a distinctive dictionary type (Kirkness, 2004). The main features of the *OALD* are: (1) the indication of the syntactic patterns of verbal constructions by means of a code using letters and figures; (2) the systematic indication of other information necessary for encoding, such as whether nouns are countable or uncountable, and what the plurals of nouns, the comparatives of adjectives, and irregular verbal forms are; (3) a large number of examples, representative of current usage; (4) the indication of the received British pronunciation (RP) by means of the transcription of the International Phonetic
Association (IPA); (5) pictorial illustrations; (6) the presence of a certain number of appendices, such as illustrations, irregular verbs, punctuation, numerical expressions, and weights and measures (Béjoint, 2000, pp. 66-67); (7) an emphasis on explicit synonym discrimination and description; and (8) the use of stylistic labels or pragmatic markers to indicate register, range, and subject field (Kirkness, 2004, p. 69).

The *LDOCE* appeared in 1978, edited by Paul Procter, to complete with the *OALD*. It was again published in 1987, 1995, and 2001. It was essentially similar to the *OALD* in organization and information provided, but included a number of significant innovations (Kirkness, 2004). One of these innovations was the use of a controlled defining vocabulary of 2,000 words. Secondly, it included a more transparent alphanumeric notation for verbal patterns and the codification of noun and adjective complementation. Thirdly, it gave IPA transcripts for both British and American pronunciations. Finally, it used computer assistance, mainly to check the consistency of the defining vocabulary. The second edition, published in 1987, extended the use of a computerized corpus as the basis for its textual examples. The third edition, published in 1995, introduced index-like menus and “signposts” to distinguish between the senses of polysemous words.

The *CCED* was published in 1987, edited by John Sinclair. It was then published in 1995 and 2001. It claimed to be an essentially corpus-based dictionary of “real English” (Kirkness, 2004). All examples of usage were taken directly from a computerized corpus of some 20 million running words, with minor adaptations, and meanings and uses were explained in a discursive, full-sentence style, similar to teacher
talk. Furthermore, the syntactic patterns of verbs, nouns, and adjectives are indicated in coded form in an extra column, separately from semantic information.

In 1995, Cambridge University Press brought out the CIDE, edited by Paul Procter. It was based on the Cambridge Language Survey of 100 million words taken from the major standard varieties of English, including British, American and Australian English. It also used a corpus of learner English, which identified typical learner errors. Like the CDOCE, the CIDE used “guidewords” to help users to distinguish between the senses of polysemous words. Finally, it included the phrase index listing multiple-word items under each item a learner might look up.

The newer editions of these four dictionaries have incorporated further revisions and innovations, and they have further improved in terms of quantity/quality of information and user friendliness. Furthermore, the recent editions of the four dictionaries are all available in CD-ROM and/or online with extra features, including the native speakers’ pronunciation for each word, additional grammatical and usage information, corpus examples, visual and audio materials, and interactive exercises and games (Nesi, 1999b).

Also, numerous other MLDs have been published. Currently, a whole range of MLDs are available for all levels of proficiency. In addition, there are many specialized works, such as dictionaries of pronunciation, collocation, and idioms and phrasal verbs. A number of technical learners’ dictionaries for specific areas, such as business and computing, are also available. Furthermore, there are encyclopedic learners’ dictionary, such as the Oxford Advanced Learner’s Encyclopedic Dictionary (1993), and the
Longman Dictionary of English Language and Culture (1993, 2000), and learners’ thesauruses, such as the Longman Lexicon of Contemporary English (1991) and the Oxford Learner’s Wordfinder Dictionary (1997). A recent innovation is the bilingualized dictionary, which is the monolingual dictionary with translations into students’ native language. This type of dictionary is available for Hebrew, Japanese, Greek, Brazilian, Arabic, and many other languages.

The Scene of English-Japanese/Japanese-English Dictionaries

The information summarized in this section is largely based on Nakao (1998). English-Japanese (E-J) and to lesser extent Japanese-English (J-E) dictionaries are the types of dictionaries that are used most frequently by Japanese learners of English. Approximately 50 E-J dictionaries and about half that number of J-E dictionaries are currently available.

The bilingual E-J dictionaries were indebted to British and American dictionaries and some of the earlier E-J dictionaries are virtually foreign reference books translated into Japanese. However, their competitive market has made E-J dictionaries of today “not only an excellent amalgamation of British and American lexicography but also one of the best executed models of bilingual dictionary in the world” (p. 42). The E-J dictionaries can be divided into three groups in terms of size and intended users. First, there are full-sized comprehensive dictionaries with more than 100,000 entries, which are intended for scholars and advanced learners. The second group consists of medium-sized dictionaries containing from 50,000 to 100,000 entries, which are intended for high school and/or college students and are the most profitable products. The third group comprises E-J
dictionaries for beginners. The major innovations of E-J dictionaries of the second group include: (1) the selection of entry words to be equally representative of British and American English, (2) the provision of the distinction between countable and uncountable nouns, (3) the provision of verbal patterns by means of labels denoting the actual parts of speech and word groups as opposed to complex codes, (4) the inclusion of etymology to accommodate a natural curiosity of dictionary users in their upper teens and above, and (5) the grading of information including entry words, translations, and grammatical information so that a user can see the relative value of information provided and make the most effective use of the dictionary entry.

In contrast, J-E dictionaries conventionally provide English translations of Japanese words without information on the usage or the differences between the English equivalents. In the late 1970s, some lexicographers started designing J-E dictionaries to meet the demand for user-friendly encoding. The major features of these innovative J-E dictionaries include: (1) the inclusion of headwords, which are more commonplace and less bookish; (2) the presentation of headwords in the Japanese style, which is a syllabary arrangement; (3) the inclusion of synonym discrimination and description; (4) the provision of grammatical information, such as countability and verbal patterns; and (5) the provision of hints and clues to compose English sentences.

**The Scene of Handheld EDs in Japan**

Along with such countries as Hong Kong and Taiwan, Japan is the one of the counties where handheld EDs are becoming particularly popular (Nesi, 1999b). Although EDs are available in different formats, a *denshi jisho* (an electronic dictionary) generally
refers to a handheld ED in Japan, because handled EDs are the most widely used in Japan. In the past decade, handheld EDs have rapidly spread among Japanese people, including adults, university students, and high school students. Sekiyama (2001) discusses the history of EDs in Japan by dividing it into four phases.

The first phase was characterized by an ED named the IQ-3000, the first handheld ED developed in Japan. This ED was called a *densanki* (an electronic translator) and introduced by Sharp in 1979. It included only 2800 words for the Japanese-English dictionary and 5000 words for the English-Japanese dictionary, and Japanese equivalents were indicated in katakana. It was more an electronic wordbook than a dictionary.

The second phase was marked by the EDs that included about the same number of headwords as PDs and defined words through three writing systems. The first of this type was the *Denjirin* brought to the market by Sanyo in 1987. This ED included an English-Japanese dictionary with 4000 headwords, and the user could add a Japanese-English dictionary with an IC card. However, it included only headwords and definitions, and its size was as big as a mini laptop computer.

The third phase was represented by the EDs equipped with the full contents of PDs, including grammatical and usage information. The first of this type, the TR-700, was introduced by Seiko in 1991. This ED contained the full contents of Kenkyusha’s *Shineiwachu, Waeichu*, and *Roget’s Thesaurus*. It organized a large amount of information by dividing it into three types (basic information, examples, and notes) and allowed the user to move among these three types of information by using function keys, in order to increase the readability of the small screen. Since TR-700, full-content EDs
have been the mainstream, although the second-phase EDs with only definitions still continue to be on sale to accommodate users who do not need detailed information. Full-content EDs provided the foundation for EDs to establish themselves as full-fledged dictionaries.

The fourth phase was characterized by EDs with more features and smaller sizes. Since the TR-700, full-content EDs had gone through only minor changes such as those in size and price without changing in performance, until 1999, when Seiko introduced a revolutionary ED, the SR-8000, marked by a clear screen and innovative features such as displaying two screens at one time. Since then, Seiko’s EDs have surpassed other manufacturers’ in advanced functions. In contrast, other manufacturers sought to include as much information as possible, with sizes as small as possible. The EDs in this phase are equipped with multiple dictionaries and other reference materials—including as many as fifty titles in one ED.

In the late nineties, when EDs with a Japanese dictionary called the Kojien in addition to English dictionaries appeared, manufacturers dramatically enlarged the market of EDs (Konuma, 2003). It also contributed to the increase of sales that the TV shopping dealt with EDs from 1999 to 2000 (Sasahara, Tada, & Furuyama, 2005). Additionally, manufacturers launched EDs designed for high school students in 2001, and by 2002, some high schools included EDs into the list of the dictionaries recommended upon entrance. Since then, manufacturers have increased sales for EDs among high school students (Konuma, 2003).
Currently, five main manufacturers compete for a share of the market for EDs: Casio, Sharp, Sony, Seiko, and Cannon. Among them, Casio is the top manufacturer, occupying 50% of the total market (Sasahara et al., 2005). Sasahara et al. summarize the features of EDs developed by the five major manufacturers. Casio’s EDs are characterized by variety (more than 40 kinds) and the number of dictionaries-reference materials available in one device. Sharp’s EDs are marked by clear fonts. Sony’s EDs are characterized by the ease of adding additional dictionaries. Seiko’s EDs are characterized by the ease of using a keyboard, their small sizes, and their lightness. Cannon’s EDs are equipped with functions useful for students, such as mnemonics for historical chronologies.

With a wide variety of MLDs as well as E-J/J-E dictionaries in print and electronic formats on the market, Japanese learners of English now have as wide a range of choices as ever. This suggests the need for learners to understand the kinds of dictionaries available and to have the skills to choose among them according to their purposes and preferences.

**Studies on Dictionary Use**

*Studies on General Dictionary Use*

Dictionaries are lexicographers’ products that are designed to help consumers with communication. Therefore, dictionaries should not only describe the language accurately but also meet consumers’ needs and preferences. However, the studies that examined how L2 learners use dictionaries were not conducted until relatively recently. Although publishers had conducted studies, these studies had not been available to the
Recognizing the significance of knowing L2 learners’ needs regarding dictionary use, Tomaszczyk (1979) surveyed 449 learners and speakers of 16 foreign languages concerning their use of reference materials such as monolingual dictionaries, bilingual dictionaries, restricted dictionaries (dictionaries of slang, usage, etc.), and technical dictionaries. Tomaszczyk identified several patterns of learners’ dictionary use. The vast majority of learners and speakers used dictionaries. Although they used dictionaries more frequently for reading, writing, and translation, the learners and speakers also used dictionaries for speaking and listening. Many of them used a wide variety of dictionaries, and the choice among the dictionaries depended on the information that they looked for. The learners and speakers consulted a dictionary for information on meaning, word division, spelling, and status, usage and currency of words, and receptive and productive grammar. Although the use of monolingual dictionaries became more extensive as their proficiency increased, almost all of the subjects continued to use bilingual dictionaries. However, all subjects considered bilingual dictionaries inferior to monolingual dictionaries.

Following Tomaszczyk’s research, similar studies were conducted with different subjects. Although they reveal some similar patterns, these studies show that the students were not as sophisticated in their dictionary use as Tomaszczyk’s subjects of advanced proficiency levels. Baxter (1980) investigated the use of dictionaries by 342 Japanese students of English at three national universities through a questionnaire. The results
show that the Japanese students depended heavily on bilingual dictionaries. Whereas most of them used bilingual dictionaries daily, they seldom consulted monolingual dictionaries. Baxter suspected that bilingual dictionaries discouraged the students to use communication strategies such as paraphrasing in oral activities because bilingual dictionaries employ a single lexical item as meaning, unlike learner’s monolingual dictionaries that use syntactic construction as a definition. Béjoint (1981) examined the use of monolingual dictionaries by 122 students of English at a French university through a questionnaire. Many of the subjects used dictionaries on a daily basis. The students used dictionaries more often for written activities than for oral activities, and for decoding than for encoding. The students searched for information on meaning, syntax, synonyms, spelling, pronunciation, and language variety. They considered monolingual dictionaries more satisfactory than bilingual dictionaries. The subjects were not skilled in the use of dictionaries. In particular, many of them did not use the coding systems for syntactic patterns provided in learners’ dictionaries nor did they read the front matter.

Fan (2000) reports on the use of bilingualized dictionaries by Chinese students, using the information from one section of the vocabulary learning strategies questionnaire, which asked about information provided by bilingualized dictionaries (Fan, 2003). Fan found that the majority of students (90%) used bilingualized dictionaries and perceived them as useful. Students “often” looked up the context meaning of words and “sometimes” looked up the Chinese equivalents, the derived forms, the grammatical usages, and all meanings of words. They “seldom” looked up the collocations, pronunciation, frequency, and appropriateness of words. More proficient students in
vocabulary knowledge used most of dictionary information more often than the less proficient students. In particular, they used information such as English definitions, pronunciation, frequency, and appropriateness significantly more often and regarded them as helpful. A negative correlation between Chinese equivalents of words and other types of information suggests that over-reliance on Chinese may have led to the neglect of other kinds of word knowledge. This study suggests that many students did not make full use of bilingualized dictionaries or were unaware of the importance of various aspects of word knowledge.

These studies employed a survey and demonstrated learners’ general patterns of dictionary use. They show that: (1) most L2 learners, including advance learners, depend on dictionaries; (2) although they most frequently use dictionaries for word meaning, L2 learners use dictionaries for other information such as pronunciation, spelling, and syntax; (3) although they primarily use dictionaries for written tasks, L2 learners also use dictionaries for oral tasks; (4) bilingual dictionaries are used more widely than monolingual dictionaries, even though learners consider them to be inferior to monolingual dictionaries; (5) high proficiency learners use monolingual dictionaries more extensively than lower proficiency learners, although all learners continue to use bilingual dictionaries; and (6) some learners may not be skilled enough in dictionary use to make the maximum use of dictionaries.

As they are becoming popular among L2 learners, handheld EDs have become the focus of some studies (Nesi, 1999b; Tang, 1997; Taylor & Chan, 1994;). Taylor and Chan (1994) report on the use of EDs by 424 students in a tertiary education institution in
Hong Kong. A small number of students also participated in follow-up interviews. Additionally, 12 teachers were interviewed about their students’ use of EDs. Taylor and Chan found that nearly all EDs used by the students were bilingual English and Chinese dictionaries. Although their EDs offered the functions that were not available in PDs (e.g., spoken pronunciation, a spelling checking, and a search function), they failed to meet several of the ten criteria of a good learner’s dictionary stated by Hartmann (1992) (e.g., the provision of collocational, stylistic, and cultural information). Eighteen percent of students reported using an ED. The nonusers of EDs did not use them due to their poor quality (43%) and their costs (35%). Many students used their EDs to find the meaning of English words (all respondents), the spelling of English words (60%), the Chinese equivalent of an English word (44%), the English equivalent of a Chinese word (34%), parts of speech (30%), synonyms (27%), and antonyms (22%). Twenty-eight percent of the respondents used their EDs more than their PDs, 46% used PDs more, and 26% used the two types of dictionaries about the same amount. Whereas the perceived advantages of EDs included portability, ease and speed of use, and the provision of speech, the perceived disadvantages included the brevity and inaccuracy of information, the limited number of headwords, and the absence or inadequacy of examples. Most of the teachers interviewed were concerned about the quality of EDs, and some also pointed out the possibility of discouraging students to guess word meanings from context. All teachers preferred their students to use PDs.

Nesi (1999b) reports on the result of a survey about the use of dictionaries by international students entering a university in England for the 1995-1996 academic year.
There were only ten students who owned an ED, and the majority of them were from Asian countries. All ten students were excited about their EDs. Although all of them also owned PDs, only one student used her PD more often than her ED. The perceived advantages included portability, ease of use, availability of sound, the provision of a variety of search routes, and the capacity of being expanded and/or linked to other applications. The perceived weaknesses included insufficient coverage, insufficient grammatical, collocational and pragmatic information, and simplistic translation.

Tang’s (1997) study involved 254 Chinese students of English and 20 ESL teachers in Vancouver, Canada. Her study differs from other studies on dictionary use in that it employed multiple methods. The students’ use of bilingual EDs was investigated using a survey, observations, and documents (e.g., assignments, handouts, vocabulary notebooks). Additionally, the teachers were interviewed on their perceptions on students’ use of EDs. Tang found that 87% of the students owned an ED. Most of the dictionaries used by students lacked some of the ten features of a good learner’s dictionary listed by Hartmann (1992), such as the provision of detailed grammatical codes, example sentences, collocational and cultural information. EDs appeared to help learners both with comprehension and production of English. Especially, those with good knowledge of their L1 and English grammar benefited the most from electronic dictionaries. Although many students found it difficult to decide on the most appropriate meaning from multiple meanings provided in the dictionary, they attempted to choose the right one by interacting with the text and using contextual cues. Students considered their EDs useful due to their portability, speed, availability of sound, and availability of their L1. In
contrast, teachers exhibited concerns about their students’ use of electronic dictionaries, although they saw some advantages in using them. Tang’s research may suggest that EDs are not as harmful as many researchers and educators think. It also demonstrates that multiple research methods can produce more rigorous data on dictionary use than a single method.

These studies seem to suggest the potential of EDs as one of the many useful aids for L2 vocabulary learning because of the unique advantages they offer, despite some problems with their quality. Clearly, no extensive conclusions can be drawn from these limited studies, which were conducted in different sites during different periods, especially because the technology is developing rapidly, and the quality of EDs is improving at a fast pace.

The studies reviewed in this section all employed written questionnaires and successfully revealed learners’ general patterns of dictionary use. However, this type of study may provide less accurate data because items in a questionnaire are asked out of context (Cohen, 1998). Tang (1997) overcame this problem to some extent by combining a survey with other research methods. The research reviewed in the next section yielded more reliable data by studying learners while engaging in a particular reading task.

**Studies on Dictionary Use While Reading**

The other major group of studies examined learners’ use of dictionaries while reading. This is plausible because learners use dictionaries the most frequently while reading (Béjoint, 1981; Tomaszczyk, 1979). Many of the studies that are classified as this group are conducted using experimental designs
or/and computer tracking. The studies in this group can be divided into three subcategories, drawing on the three stages of dictionary use that Scholfield (1997) identified: choice, look-up, and learning. When they consult dictionaries, learners first have to decide which words they look up. Then, they have to locate the information that they need. Finally, the look-up may or may not promote long-term learning of the word. The success of a look-up depends on skillful performance at each of these stages.

The first category of studies examined learners’ choice to use a dictionary. When they encounter unknown words while reading, learners can choose among the three LPSs. The strategic choice between these options is an important skill for L2 learners because balancing dictionary use and the use of other LPSs seems to be crucial for L2 vocabulary learning (Fraser, 1999b; Scholfield, 1997; Tang, 1997). Both Hosenfeld (1977) and Adamson (1990) found that less successful L2 readers used dictionaries too often. The less successful readers engaged in word-by-word decoding at the expense of the overall comprehension.

Hulstijn’s study (1993) belongs to this group. Hulstijn examined the look-up behaviors of 44 Dutch learners of English while reading a chapter of a novel. Computer tracking was used in this study. The subjects read the text on the computer screen, with access to an electronic glossary. Hulstijn found that the learners were capable of using the dictionary strategically, without looking up all the unknown words. The learners looked up more frequently words that were perceived as relevant for their reading goals than the words that were perceived as irrelevant. Furthermore, learners looked up less frequently words that were easily inferred from context than words that were not easily inferred.
Students with greater vocabulary knowledge looked up fewer words than those with smaller vocabulary. In contrast, students with higher inferring ability looked up words as frequently as those with lower inferring ability, indicating that students with higher inferring ability may have used the dictionary when they did not have to. This research demonstrates that learners are generally strategic in their choice to use a dictionary.

The second category of studies is concerned with learners’ look-up strategies. These studies have examined how learners use dictionaries, namely, what kind of information they search for and what strategies they use or fail to use in their searches. Neubach and Cohen (1988) studied 6 Hebrew-speaking EFL learners’ use of a learner’s monolingual dictionary and a bilingual dictionary while reading. This study is important, because, unlike other studies on dictionary use that primarily quantified data, it qualitatively examined the process of dictionary use, using think-aloud protocols and interviews. The results show that dictionary use is not a simple task. Success in the search for the meaning of a word depended on the formation of expectations regarding the possible meaning from context before consulting a dictionary. In addition, learners had difficulty with such mechanics as alphabetical order, symbols, and abbreviations. High-proficiency students preferred the monolingual dictionary whereas intermediate and low-level students preferred the bilingual dictionary. By using think-aloud protocols and interviews, this research describes the process of dictionary use in detail.

Laufer and Hill (2000) examined L2 learners’ look-up patterns and the relationship between their look-up patterns and retention of the looked up words, using a Computer Assisted Language Learning (CALL) program. Their subjects were 72 EFL
university learners in Hong Kong and Israel. They were asked to read an academic text on the screen with access to different lexical information of highlighted words. The subjects’ look-ups were electronically recorded. Laufer and Hill found that not only did different learners have different look-up behavior but also the groups of learners in each country behaved differently. The Hong Kong learners looked up words almost twice as often as the Israeli learners. The Hong Kong learners preferred to look up English meanings of unfamiliar words whereas Israeli learners had a preference for L1 translation. The use of multiple dictionary information was associated with better retention. This research shows differences in look-up preferences of individual learners.

The last category of studies investigated the effects of dictionary use on the retention of the looked-up word. After looking up a word for an on-going activity, learners may forget the word or may retain it. Luppescu and Day (1993) examined the effects of the use of bilingual dictionaries by 293 Japanese learners of English on their vocabulary learning. Students in the treatment group read a short story using a bilingual dictionary, and those in the control group read the same story without using a dictionary. Immediately after reading the short story, they took a multiple-choice vocabulary test containing the target words encountered in the passage. Luppescu and Day found that the treatment group performed significantly better than the control group on the vocabulary test. However, some vocabulary items were more difficult for the treatment group than for the control group. These items were those that had a large number of meanings in the dictionary, suggesting that students in the treatment group had difficulty selecting the
appropriate meaning from all the meanings listed. Moreover, those in the treatment group took nearly twice as long to read the passage as the control group.

Knight (1994) investigated the effects of dictionary use on the retention of words and reading comprehension, using 105 American college students of Spanish. The students were assigned to the dictionary or non-dictionary conditions and read short articles on the computer screen. The computer was programmed to track the subjects’ look-ups. Knight found that the experimental group with access to a dictionary retained more words both on immediate and delayed tests. The experimental group also achieved higher reading comprehension scores than the non-dictionary group. The low verbal ability group benefited more from the dictionary condition than the high verbal ability group. When reading time was taken into account, the benefit of consulting the dictionary was questionable for the high verbal group, which confirms the finding of Hulstijn’s study (1993). Knight’s study is significant because it proved that dictionary use helps learners with vocabulary acquisition as well as comprehension, using a careful research design.

On the other hand, Hulstijn et al. (1996) focused on the effects of the use of a dictionary and marginal glosses on the retention of the words. Seventy-eight Dutch first-year university students of French read a short story under the three conditions: marginal gloss (MG), dictionary use (D), and control (C). The results show that the retention of the meaning of unknown words was the highest in the MG group. The D group did not perform significantly better than the C group because the students in the D condition seldom used the dictionary. However, when the students in the D condition did use the
dictionary, the retention scores of the D group were as high as, or even higher than those of the MG group. Hulstijn et al. attribute the somewhat different finding from Knight’s study to the length of the text used; the text used in their study was much longer than that used in Knight’s study.

Fraser (1999b) focused on the dictionary use of eight ESL learners, using the same data from the study on LPSs (Fraser, 1999a). Fraser found that learners used consulting relatively infrequently (39% of total encounters with unfamiliar words). Great individual difference was found in the rate of consulting; mean rates ranged from 6% to 75%. They consulted a dictionary alone (55%) and following an inference (45%). When they consulted, most of time (87%), they included a decision statement on selection of the strategy. When consulting alone, about a quarter of the time, there was indication of monitoring of the outcome (e.g., evaluating whether dictionary meaning fits the context). When inferring and then consulting, the rate of monitoring increased to 59%. Students were largely successful in determining the word meaning when consulting either alone or in combination. When they consulted alone, they demonstrated full comprehension 76% of the time and partial comprehension 5% of the time. When they inferred and then consulted, they demonstrated full comprehension 83% of the time and partial comprehension 7% of the time. Consulting also positively influenced word retention. When students consulted alone, they recalled the word meaning that they had determined about 30% of the time. Moreover, when they inferred and then consulted, they had a higher retention rate (50%). This study suggests that L2 learners are capable of using a dictionary skillfully. Also, consulting a dictionary facilitates comprehension and retention.
of words. Furthermore, consulting in combination with inferencing is the most effective for retention and comprehension.

The studies on dictionary use while reading produced an accurate picture of learners’ look-up behavior when the learners engaged in particular tasks, primarily using experimental designs and/or computer tracking. These studies found that: (1) the use of dictionaries is a complex task; (2) learners can choose the words to be looked up strategically; (3) learners develop their own look-up strategies and preferences; (4) there are great individual differences in the rate of consulting; (5) dictionaries can facilitate not only vocabulary learning but also reading comprehension; (6) consulting followed by inferencing is the most effective for vocabulary learning; (7) some high-verbal-ability students may use dictionaries when they do not need to; and (8) the use of dictionaries does slow down reading.

Computer tracking and experiments produce accurate and objective data; however, these methods are not free from limitations. Experiments create more or less artificial learning conditions. For example, some studies used pseudo words (e.g., Hulstijn, 1992). Moreover, many of the studies used short texts (e.g., Knight, 1994; Laufer & Hill, 2000); however, learners often use longer texts in real situations. Furthermore, students’ awareness of participating in a study may cause them to act differently. A major drawback of computer tracking is its inability to record learners’ strategic behavior that cannot be tracked by the computer. Research using different methods must complement that using experiments and/or computer tracking for comprehensive understanding of learners’ use of dictionaries. Neubach and Cohen’s
(1988) study and Fraser’s (1999a, 1999b) study that used think-aloud protocols and interviews proceed in this direction. More studies like these are needed. Although they use dictionaries most frequently while reading, learners use dictionaries in activities other than reading. Several studies examined learners’ use of dictionaries in other activities. The next section reviews the studies on dictionary use while writing.

Studies on Dictionary Use While Writing

Some studies examined learners’ use of dictionaries in writing tasks. These studies employed such methods as experiments and introspective self-reports. Harvey and Yuill (1997) studied 211 learners’ use of a learner’s monolingual dictionary, the Collins COBUILD English Language Dictionary (CCELD), through introspective self-reports. Harvey and Yuill found that the success rate of look-ups was high (84.4%). The learners searched for information on spelling and meaning the most frequently. They depended on examples for a variety of information. However, grammatical codes were largely unused by the learners. Difficulties in searches resulted from the absence of required information from entries or from its location in long entries. These problems were similar to those identified in Béjoint’s study (1981).

Laufer and Hadar’s (1997) study involved dictionary use in composing a sentence. They compared the effects of three types of dictionaries: monolingual, bilingual, and bilingualized, on both comprehension and production of new words. The participants were 76 high school students and 46 university students in Israel. Comprehension of the words was checked using a multiple-choice test, whereas production of the words was tested by asking the students to compose original sentences
with the words. Laufer and Hadar found that the bilingualized dictionary produced significantly higher scores than the other two conditions for comprehension and significantly higher scores than the monolingual dictionary for production. The more skilled in using dictionaries the learners were, the more they appeared to benefit from monolingual dictionaries. However, the bilingualized dictionary also produced the best scores for the skilled learners. This research suggests that bilingualized dictionaries may solve the contradiction that many learners depend heavily on bilingual dictionaries despite the perceived problems of these dictionaries. The next study involves a new type of reference materials, concordances.

Todd (2001) investigated the use of concordances in self-collection of errors in writing. Twenty-five postgraduate students of science and engineering taking an English course at a Thai university participated in this study. Todd found that the learners were able to induce valid patterns from self-selected concordances and to use the patterns in self-correction of their errors. The students were more likely to apply the patterns inducted for lexical items with few patterns of usage or meaning. This study demonstrates that concordances can be used as useful reference materials that may promote learner autonomy. Moreover, Harvey and Yuill’s (1997) study and this study may suggest the importance of example sentences for learners, especially in production.

In summary, the studies on dictionary use while writing demonstrate that various types of reference materials, including concordances, help learners complete writing tasks. However, more research is needed to draw any specific conclusions.
Studies Comparing EDs and PDs

Relatively little research has been conducted on the relative impact of EDs and PDs on L2 learning. Leffa (1992) was one of the early researchers who investigated the effects of EDs. Leffa compared an electronic glossary with a PD in effectiveness for completing a reading comprehension task. Each of 20 beginning-level Brazilian learners of English took two reading comprehension tests based on authentic texts, one test using the PD and the other using the electronic glossary. Students were able to understand 86% of the passage with the electronic glossary, indicating that the electronic glossary made an authentic text comprehensible for beginners. Furthermore, the electronic glossary allowed subjects to understand 38% more of the passage, using 50% less time.

Aust, Kelley, and Roby (1993) examined the effects of online EDs relative to PDs on consultation frequency, study time (time needed for completing reading), efficiency (consults per minute), and comprehension. Eighty American undergraduate students read a Spanish article under one of four conditions: an electronic article with a bilingual online ED, an electronic article with a monolingual online ED, a paper article with a bilingual PD, and a paper article with a monolingual PD. The ED group consulted over twice as many words as the PD group. Moreover, the ED group looked up more words per minute, and the gain of the ED group was more noticeable with bilingual dictionaries than with monolingual dictionaries. Although the difference was not significant, the ED group spent 20% less time reading than the PD group. Differences in comprehension between the PD and ED groups were not significant. Aust et al. conclude that EDs lower the “consultation trigger point” (p. 70) with their easy access.
Koga (1995) compared the effectiveness of an online ED and a PD for L2 reading. Forty Japanese university students were required to read six texts in three conditions (no dictionary, PD, and ED) and to answer comprehension questions. Koga found that students read faster in the no-dictionary condition than in the ED condition, and faster in the ED condition than in the PD condition. Also, for the higher-reading-ability group, the mean reading comprehension score was higher in the ED condition than in the no-dictionary condition, and higher in the no-dictionary condition than in the PD condition. There were no differences in any of the three conditions for the low-reading-ability group, possibly due to the floor effects. Koga concludes that the ED had less interference in the reading process and facilitated students’ comprehension.

Inami, Nishikata, Nakayama, and Shimizu (1997) compared a CD-ROM based dictionary and a PD in their effectiveness for learning a set of English words. Eighty Japanese undergraduate and graduate students learned either the definition or spelling of each English word by consulting a CD-ROM based dictionary or a PD. Then, they took two types of vocabulary tests, the tests that required supplying either the definitions or spellings of the learned words. The scores on both the tests were higher in the CD-ROM condition than in the PD condition, when students were allowed to search freely each word within the limited time period. However, there was no significant difference on the test scores between the two conditions, when students were allowed to search each word only once. When students were allowed to search freely each word, search time was reduced in the CD-ROM condition, and students were able to consult one word multiple times.
times, which may have resulted in improved test scores. Students rated the CD-ROM dictionary as more efficient for learning than the PD.

Several researchers have focused on the handheld EDs. Iwamato (1998) compared the efficiency of a handheld ED with a PD for accessing the first meaning in an entry and the contextual meaning. Ten university students were asked to locate the first meaning in an entry for a set of words, using an ED and a PD. Next, they were asked to locate the contextual meaning in an entry for another set of words, using an ED and a PD. Iwamoto found that the students accessed the first meaning more than three times faster with an ED than with a PD, and that they accessed the contextual meaning more than two times faster with an ED than with a PD. Individual differences were smaller in the ED condition than in the PD condition, indicating that an ED allows efficient access to information for all students.

Shimizu (2003) investigated the relative effects of an ED to a PD on empirical and perceived efficiency of meaning and example retrieval. Seventy-seven university students took a speed test that required locating word meanings and examples, using either an ED or a PD. They also completed a survey about their perceptions of the two dictionary types. The results indicated that an ED was more efficient in accessing word meanings, and that the effect was multiplied by the users’ familiarity with an ED. However, there were no differences between the two dictionary types in the efficiency of accessing examples. The participants overwhelmingly preferred an ED.

Koyama and Takeuchi (2003) examined how Japanese EFL learners’ searching behavior differed when using an ED and a PD. Twenty-six college students and 16 high
school students read a text using either a PD or an ED. A week after the experiment, they were given two types of tests: recall and recognition. Students also answered a questionnaire about their impressions on the dictionary they had used. Koyama and Takeuchi found no significant differences in respect to either the number of words looked up and search time, although the ED group of high school students tended to look up more words. There were no significant differences in the rate of recall or the rate of recognition. Most students evaluated the ED highly due to its portability and ease of use; in particular, high school students evaluated the ED more highly than college students, possibly owing to their familiarity with digital media. Although the ED and PD contained the same amount of information, students felt that the ED did not provide sufficient information. Koyama and Takeuchi explained this by the ED’s interface design. Since its screen was small, the ED forced students to go to different screens to get detailed information. Therefore, students felt that it did not contain sufficient information although it actually did.

In another study, Koyama and Takeuchi (2004) examined how the difference in the interface designs of an ED and a PD affected EFL students’ searching behavior. Eighteen undergraduate students read two texts without a dictionary and took a vocabulary test with a PD or an ED. The vocabulary test asked students to write definitions for target words by using the dictionary for four words and to quote usage examples from the dictionary for the other four words. A week later, students took recall and recognition vocabulary tests. Koyama and Takeuchi found that there were no significant differences in search time and the quantity of retrieved information between
PD and ED conditions, due to the improvement of the ED’s interface design. Although no differences were found between PD and ED conditions in the rate of recall, the mean score was significantly higher in the ED condition than in the PD condition in the rate of recognition. Finally, although they regarded it as convenient, the students did not necessarily believe in the effectiveness of an ED for learning EFL. Koyama and Takeuchi conclude that the elaborative work in the process of searching in the PD condition leads to higher retention.

Osaki, Ochiai, Iso, and Aizawa (2003) compared the effects of an ED and a PD on accessing appropriate meaning, reading comprehension, and word retention. One hundred sixty-seven Japanese university students were asked to read a text and write down the definitions of the underlined words in one of the three dictionary conditions: the ED, the PD, and the no-dictionary (ND). Next, all students took a comprehension test in the fill-in-the-blank format. The two dictionary groups were also given a vocabulary test that required supplying definitions for 15 target words immediately as well as a week later. Osaki et al. found that the ED scored the best on the definition test, followed by the PD group. The ED groups also outperformed the PD groups on the reading comprehension test, which in turn outperformed the ND group. These results suggest that an ED facilitates choosing the contextual meaning as well as comprehending a text better than a PD, although the PD is still more helpful than no dictionary. There were no significant differences between the ED and PD groups on both the immediate and delayed vocabulary tests, suggesting that dictionary types do not influence word retention.
Iso and Osaki (2004) partially replicated the above study. Using the same research design, they compared the effects of an ED and a PD on accessing appropriate meaning, reading comprehension, and word retention. The same 167 students participated in this study. An easier text than the one used in the previous study was chosen. Instead of tests in the open-ended and the fill in the blanks formats, a reading comprehension test and a vocabulary test in the multiple-choice format were used. Iso and Osaki found that there were no differences between the dictionary groups in reading comprehension. Although significant differences were found between the ND group and the two dictionary groups, there were no differences between the PD and ED groups in accessing the appropriate word meaning. There were no significant differences between the PD and ED groups in word retention.

With a limited number of studies and mixed results, it is impossible to claim EDs’ superiority to PDs in their effectiveness for L2 learning. Clearly, more research should be conducted on the relative advantages of EDs and PDs.

**Conclusion**

Although only a limited number of studies have been conducted on L2 learners’ use of dictionaries, these studies appear already to have offered important information for researchers and teachers. Research on this topic has demonstrated that despite some scholars and teachers’ negative perceptions, dictionaries are important tools for L2 learners. In particular, most learners depend on bilingual dictionaries, although they are generally perceived as inferior to monolingual dictionaries. The use of dictionaries is a complex task; however, learners cope with this task by developing various strategies.
Learners’ proficiency level, personal preferences, and nationalities seem to be related to their choice of strategies. Although learners primarily use dictionaries for word meanings, they use dictionaries for other information such as spellings, pronunciation, syntax, and synonyms. Learners seem to rely on the examples provided in the dictionary, especially when writing. Dictionaries help learners with not only communication but also vocabulary acquisition. Furthermore, recent research demonstrates that new types of reference materials such electronic dictionaries and concordances can enhance learning. However, some learners may not take full advantage of dictionaries. Some learners exclusively use bilingual dictionaries, whereas other learners ignore grammatical codes provided in learner’s monolingual dictionaries. Moreover, some high-ability learners may use dictionaries when they do not need to.

Although the previous studies seem to have yielded significant findings on L2 learners’ dictionary use, there is more to be found in this area. These studies that have been conducted so far have thematically narrow scopes. More research with different foci is needed. For example, since the strategic choice to use dictionaries over other LPSs seems to be crucial, more research is needed in this area. Also, more research on electronic reference materials is needed, because learners increasingly depend on these materials.

Furthermore, we also need more variety in terms of research methods. Most research has produced quantitative and cross-sectional data through questionnaires, experiments, and computer tracking. Future research must include qualitative analysis of data. As Blachowicz and Fisher (2001) point out, since vocabulary learning occurs in
particular contexts, future research must focus on specific tasks, contexts, and learners. Neubach and Cohen’s (1988) study using a think-aloud method and interviews is a good example that investigated the use of dictionaries qualitatively. Moreover, since vocabulary acquisition is an incremental process, longitudinal studies will produce significant data. Although it focused on contextual guessing, Parry’s (1991, 1993, 1997) studies set good examples. In these series studies, Parry examined several ESL students’ guesses of the unknown words encountered in their anthropology textbooks throughout the semesters, both quantitatively and qualitatively. Furthermore, combining multiple methods seems to increase the rigor of data. Tang (1997), for example, obtained a comprehensive picture of the learners’ use of EDs by collecting quantitative and qualitative data through a questionnaire, interviews, documents, and observation.

Taking the lead from these studies, in order to add to the limited qualitative research currently available, this study examined Japanese learners’ use of EDs compared with PDs in relations to other LPSs. Their use of dictionaries was investigated both qualitatively and quantitatively through multiple investigative techniques including a written questionnaire, interviews, a retrospective think-aloud procedure, and tests.
CHAPTER 3

METHOD

Overview

The present study investigated the use of pocket electronic dictionaries (EDs) as compared with printed dictionaries (PDs) by Japanese learners of English, both quantitatively and qualitatively. The quantitative paradigm provided the study’s framework, while qualitative techniques were used to understand quantitative data in more depth. This study consisted of two phases. In Phase 1, quantitative data were collected through a written questionnaire on lexical processing strategy (LPS) use, the Vocabulary Levels Test assessing vocabulary size, and the Reading Comprehension section of the TOEFL assessing reading proficiency. In Phase 2, both quantitative and qualitative data were collected from the selected students through follow-up interviews that focused on the questionnaire, retrospective think-aloud protocols elicited during a reading session, and two types of vocabulary tests administered one week after the session.

Participants and Settings

Research Site

Two hundred seventy-nine students in eight intact classes at three universities participated in Phase 1 of the study, and 22 students who were selected from the larger
group of 279 students participated in Phase 2 of the study. The three universities, K University, T University, and N University, are all located in the western part of Japan. These universities were chosen as the research sites for this study due to the researcher’s easy access and familiarity with them. An additional reason for their selection was the differences between the three universities in the school cultures and the students’ English proficiency. Each of the three universities was intended to be typical of other universities with similar school cultures so that, as a whole, they would constitute a representative sample of the universities in this region.

The three universities significantly differed in their school cultures. K University is one of the most prestigious universities and admits only high-achieving students, T University is a middle-ranked university that accepts a wider range of students, and N University comes between these two universities in selectivity. Generally speaking, the students of K University are highly motivated, those of N University are also fairly motivated, and those of T University are less academically motivated. Another difference is that K University and N University are public institutions that offer the traditional curriculum. In contrast, T University is a private institution that makes innovative features its selling points, including “the ample opportunities to learn oral communication skills from native-speaking teachers” in the Department of English.

These differences between the three universities in their school cultures appeared to be true for the sample of the present study. The participants of this study came from eight classes: two classes at K University taught by a Japanese instructor, four classes at T University taught by an American instructor, and two classes at N University by the same American instructor. The instructor of K University stated that the majority of her
students were very motivated and came to class well-prepared. In contrast, the instructor who taught both at T University and N University commented that most of his students at T University were less motivated and did not actively participate in the class, whereas those at N University enthusiastically participated in the class.

Furthermore, the students at the three schools seemed to differ in their English proficiency. Among the 279 students who completed the questionnaire, Vocabulary Levels Test scores were available for 251 students, and TOEFL scores were available for 235 students. The analyses of variance (ANOVAs) revealed significant differences among the students at the three universities in their Vocabulary Levels Test and TOEFL scores, $F(2, 248) = 223.052, p = .000$, $F(2, 232) = 117.370, p = .000$, respectively. Post hoc Shaffé tests were used to compare the means for the three schools. Analysis revealed that on the Vocabulary Levels Test, the students at K University scored significantly higher than those at N university, who in turn scored significantly higher than those at T University. On the TOEFL test, however, the students at K University scored significantly higher than those at N University and K University.

**Participants of Phase 1**

After the two instructors provided the signed support letter with the researcher (see Appendix A), an invitation letter for Phase 1 (see Appendixes B and C) was given to all 279 students, each of whom was enrolled in one of eight intact classes taught by the two instructors at the three universities: two classes at K University, four classes at T University, and two classes at N University. Along with the letter, students were given a consent form, asking them to indicate their willingness to participate in the study (see Appendixes D and E). All of them indicated their interest in participating.
All 279 students were asked to participate in the study. This sample size was thought to be large enough to make the findings of this study applicable to other students in similar contexts. The sample consisted of 169 freshmen, 81 sophomores, 21 juniors, and 8 seniors. The students majored in a variety of disciplines such as agriculture (44), education (73), English (115), and cross-cultural studies (47). There were 110 male and 169 female students. All students, except for a few Chinese speakers, were native speakers of Japanese. Prior to the study, students had studied English for six or seven years and were considered to be at the intermediate level of English proficiency. For these students, the mean score on the Vocabulary Levels Test was 70.8 out of 150 ($N = 251$, $SD = 30.2$), and the mean score on the Reading Comprehension section of the TOEFL was 18.4 out of 50 ($N = 235$, $SD = 9.9$). According to *TOEFL Test Preparation Kit* (2003), the mean score of 18.4 on the Reading Comprehension section is equivalent to a total TOEFL score of 410-430.

The students were classified into PD and ED users according to the frequency of use of each type of dictionary, as indicated in Item 2 of Part 1 of the questionnaire. Operationally, those who used an ED more often than a PD (those who reported using an ED either “primarily” or “more often”) were considered ED users, whereas those who used a PD more often than or as often as an ED (those who reported using a PD either “primarily,” “more often,” or “as often”) were considered PD users.

Since the analyses of the students’ responses on Items 1, 2, and 4 of Section 2 included the comparison between ED and PD groups in their dictionary use, ANOVAs were performed in order to examine whether there were preexisting differences between the two groups in their scores on the Vocabulary Levels Test and the TOEFL. Since these
test scores were not available for all students, they should be interpreted as only an informal reference. However, the results showed no significant differences between the ED and PD groups in their vocabulary size or reading ability, \( F(1, 249) = .001, p = .971, F(1, 233) = 117.370, p = .000, \) respectively.

The analyses of Item 5 on Section 2 (a Likert-scale item) included only 226 students who completed all three instruments (the questionnaire, the Vocabulary Levels Test, and the TOEFL), because comparisons were made between three sets of two groups (ED and PD, large vocabulary and small vocabulary, and high reading ability and low reading ability) in their LPS use. For the 226 students, once again, ANOVAs were carried out in order to examine whether there were differences between the two dictionary groups (ED and PD) in their vocabulary size and reading ability. The results of the ANOVAs with Vocabulary Levels Test scores as dependent variables showed no differences between the two dictionary groups. Similarly, the results of the ANOVAs with TOEFL scores as dependent variables indicated no difference between the two dictionary groups. The results of the ANOVA appear in Tables 3.1 through 3.4.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
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<th>p</th>
</tr>
</thead>
<tbody>
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<td>Between groups</td>
<td>1</td>
<td>74.183</td>
<td>74.183</td>
<td>0.082</td>
<td>.775</td>
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<tr>
<td>Within groups</td>
<td>224</td>
<td>203780.853</td>
<td>909.736</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>1266771.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1: Comparison Between Two Dictionary Groups According to Vocabulary Levels Test Scores for 226 Students
Table 3.2: Mean Scores and Standard Deviations of Two Dictionary Groups on the Vocabulary Levels Test for 226 Students

<table>
<thead>
<tr>
<th>Dictionary type</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>149</td>
<td>68.17</td>
<td>32.156</td>
</tr>
<tr>
<td>PD</td>
<td>77</td>
<td>69.38</td>
<td>25.841</td>
</tr>
</tbody>
</table>

Table 3.3: Comparison Between Two Dictionary Groups According to TOEFL Scores for 226 Students

<table>
<thead>
<tr>
<th>Source</th>
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<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>1</td>
<td>152.867</td>
<td>152.867</td>
<td>1.511</td>
<td>.220</td>
</tr>
<tr>
<td>Within groups</td>
<td>224</td>
<td>22665.191</td>
<td>101.184</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>99797.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4: Mean Scores and Standard Deviations of Two Dictionary Groups on the TOEFL for 226 Students

<table>
<thead>
<tr>
<th>Dictionary type</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>149</td>
<td>19.05</td>
<td>10.352</td>
</tr>
<tr>
<td>PD</td>
<td>77</td>
<td>17.31</td>
<td>9.462</td>
</tr>
</tbody>
</table>

Furthermore, the students were divided into large- and small-vocabulary groups using the median split of their scores on the Vocabulary Levels Test. The results of an ANOVA confirmed that the two vocabulary size groups significantly differed in their scores on the Vocabulary Levels Test, $F(1, 224) = 583.311, p = .000$; the large-vocabulary group had a higher mean than the small-vocabulary group (93.66 and 42.59).
The vocabulary size groups also differed in their scores on the TOEFL, \( F(1, 224) = 89.091, p = .000; \) the large-vocabulary group had a higher mean than the small-vocabulary group (23.72 and 13.00). The results of these analyses are summarized in Tables 3.5 through 3.8.

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>( F )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>1</td>
<td>147292.536</td>
<td>147292.536</td>
<td>583.311</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>224</td>
<td>56562.531</td>
<td>252.511</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>1266771.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.5: Comparison Between Two Vocabulary-Size Groups According to Vocabulary Levels Test Scores for 226 Students

<table>
<thead>
<tr>
<th>Vocabulary size</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>115</td>
<td>93.66</td>
<td>16.338</td>
</tr>
<tr>
<td>Small</td>
<td>111</td>
<td>42.59</td>
<td>15.413</td>
</tr>
</tbody>
</table>

Table 3.6: Mean Scores and Standard Deviations of Two Vocabulary-Size Groups on the Vocabulary Levels Test for 226 Students

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
<th>( F )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>1</td>
<td>6492.962</td>
<td>6492.962</td>
<td>89.091</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>224</td>
<td>16325.096</td>
<td>72.880</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>99797.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.7: Comparison Between Two Vocabulary-Size Groups According to TOEFL Scores for 226 Students
<table>
<thead>
<tr>
<th>Vocabulary size</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>115</td>
<td>23.72</td>
<td>10.831</td>
</tr>
<tr>
<td>Small</td>
<td>111</td>
<td>13.00</td>
<td>5.180</td>
</tr>
</tbody>
</table>

Table 3.8: Mean Scores and Standard Deviations of Two Vocabulary-Size Groups on the TOEFL for 226 Students

Likewise, the students were divided into two reading-ability groups using the median split of their scores on the TOEFL. The results of an ANOVA confirmed that the reading-ability groups significantly differed in their scores on the TOEFL, $F(1, 224) = 57.231, p = .000$; the high-reading-ability group had a higher mean than the low-reading-ability group (26.12 and 10.65). The two-groups also differed in their scores on the Vocabulary Levels Test, $F(1, 224) = 325.850, p = .000$; the high-reading-ability group had a higher mean than the low-reading-ability group (82.01 and 54.91). The results of these ANOVAs appear in Tables 3.9 through 3.12.

<table>
<thead>
<tr>
<th>Source</th>
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<th>MS</th>
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<th>p</th>
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<tbody>
<tr>
<td>Between groups</td>
<td>1</td>
<td>41484.968</td>
<td>41484.968</td>
<td>57.231</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>224</td>
<td>162370.098</td>
<td>724.867</td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>226</td>
<td>126671.000</td>
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</tr>
</tbody>
</table>

Table 3.9: Comparison Between Two Reading-Ability Groups According to Vocabulary Levels Test Scores for 226 Students
Table 3.10: Mean Scores and Standard Deviations of Two Reading-Ability Groups on the Vocabulary Levels Test for 226 Students

<table>
<thead>
<tr>
<th>Reading ability</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>114</td>
<td>82.01</td>
<td>31.290</td>
</tr>
<tr>
<td>Low</td>
<td>112</td>
<td>54.91</td>
<td>21.589</td>
</tr>
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</table>

Table 3.11: Comparison Between Two Reading-Ability Groups According to TOEFL Scores for 226 Students

<table>
<thead>
<tr>
<th>Source</th>
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<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>1</td>
<td>13522.357</td>
<td>13522.357</td>
<td>325.850</td>
<td>.000</td>
</tr>
<tr>
<td>Within groups</td>
<td>224</td>
<td>9295.700</td>
<td>41.499</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>226</td>
<td>99797.000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.12: Mean Scores and Standard Deviations of Two Reading-Ability Groups on the TOEFL for 226 Students

<table>
<thead>
<tr>
<th>Reading ability</th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>114</td>
<td>26.12</td>
<td>8.476</td>
</tr>
<tr>
<td>Low</td>
<td>112</td>
<td>10.65</td>
<td>3.257</td>
</tr>
</tbody>
</table>

Two additional sets of one-way ANOVAs were carried out in order to examine whether there were differences between the PD and ED groups within each proficiency group. The first set of one-way ANOVAs compared the PD and ED groups within each vocabulary-size group. The results showed no significant difference between the PD and ED groups within the small vocabulary group in the TOEFL scores, $F(1, 109) = .055, p$
= .816. However, the difference between the two groups approached to the significant level ($\alpha = .05$) in the Vocabulary Levels Test scores, $F(1, 109) = 3.602, p = .060$; the PD group had a higher mean than the ED group (96.01 and 89.41). Within the large-vocabulary group, the differences between the two groups attained the significant level in the Vocabulary Levels Test scores, $F(1, 113) = 4.434, p = .037$, and approached the significant level in the TOEFL scores, $F(1, 113) = 3.405, p = .068$; the ED group had higher means than the PD group on both of these tests (96.01 and 89.41, 25.09 and 21.24, respectively).

The second set of one-way ANOVAs compared the PD and ED groups within each reading-ability group. The results showed no significant differences between the PD and ED groups within the low-reading-ability group in their scores on both the Vocabulary Levels Test and the TOEFL, $F(1, 110) = 1.459, p = .230, F(1, 110) = .011, p = .918$, respectively. Similarly, the ANOVAs revealed no significant differences between the PD and ED groups within the high-reading-ability group in their scores on both the Vocabulary Levels Test and the TOEFL, $F(1, 112) = .001, p = .971, F(1, 112) = 1.017, p = .315$, respectively.

**Participants of Phase 2**

All 279 students who participated in the first phase of the study were given an invitation letter asking them to participate in Phase 2 of the study with a small incentive (approximately $20 per person) (see Appendix F and G). Then, they were asked to indicate their interest to participate in the second phase on the last page of the questionnaire.
The participants of Phase 2 were chosen from those who met the three conditions: (1) they indicated their willingness to participate in Phase 2, (2) they were in one of the two classes at K University or one of the two classes at T University, where the researcher had greater access to the students, and (3) they completed the Vocabulary Levels Test, the Reading Comprehension section of TOEFL, and the questionnaire.

The Phase 2 students were selected based on their responses to the questionnaire and their scores on the Vocabulary Levels Test and the TOEFL. The students were chosen so that they represented the sample as much as possible in terms of school, dictionary use, vocabulary size, and reading proficiency. The researcher contacted the selected students to schedule a two-hour meeting for a reading session and an interview. When a student was unable to participate, the next candidate with similar characteristics was chosen. Twenty-two students set up a meeting with the researcher. They were given a consent form and asked to confirm their willingness to participate (see Appendixes H and I). All of them signed the consent form.

Among the 22 students, six ED users and six PD users were chosen from K University, and five ED users and five PD users were chosen from T University. Within each school, the researcher originally planned to choose half of them from the top 25% in the Vocabulary Levels Test and the TOEFL, and chose the other half from the bottom 25% in these test scores. When no appropriate students were found, however, those who scored close to these criteria were selected.

In total, PD users constituted half of the 22 students, whereas ED users constituted the other half of the sample. Among the 22 students, 12 students attended K University, and 10 students attended T University. All of the students were freshmen. The
students’ majors included agriculture (7), cross-cultural studies (5), and English (10). There were more female students (17) than male students (5). The demographic information of the students, as well as their test scores and the comparison groups to which they belonged, is summarized in Table 3.13.

The 22 students in Phase 2, on average, had higher proficiency in terms of both vocabulary size and reading ability than the 226 students who constituted the original sample. The mean score of the Vocabulary Levels Test for the 22 students was 88.14 ($SD = 25.20$), and their mean score of the TOEFL was 21.32 ($SD = 11.78$). These means were higher than those of the 226 students (i.e., 68.58, 18.46, respectively), which may be because the 22 students were all those who were motivated enough to participate in the second phase of the study.
<table>
<thead>
<tr>
<th>Name</th>
<th>DT</th>
<th>Vocab</th>
<th>VG</th>
<th>TOEFL</th>
<th>RG</th>
<th>Gender</th>
<th>School</th>
<th>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y. K. PD</td>
<td>118</td>
<td>High</td>
<td>37</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>H. K. PD</td>
<td>110</td>
<td>High</td>
<td>40</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>International Culture</td>
<td></td>
</tr>
<tr>
<td>T. T. PD</td>
<td>96</td>
<td>High</td>
<td>20</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>S. F. PD</td>
<td>115</td>
<td>High</td>
<td>31</td>
<td>High</td>
<td>M</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>N. S. (F) PD</td>
<td>99</td>
<td>High</td>
<td>21</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>Y. Y. PD</td>
<td>100</td>
<td>High</td>
<td>16</td>
<td>Low</td>
<td>M</td>
<td>K</td>
<td>International Culture</td>
<td></td>
</tr>
<tr>
<td>S. T. PD</td>
<td>96</td>
<td>High</td>
<td>13</td>
<td>Low</td>
<td>M</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>M. S. PD</td>
<td>71</td>
<td>Low</td>
<td>18</td>
<td>High</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Y. O. PD</td>
<td>87</td>
<td>Low</td>
<td>10</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>T. F. PD</td>
<td>64</td>
<td>Low</td>
<td>8</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>S. S. PD</td>
<td>77</td>
<td>Low</td>
<td>15</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
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<tr>
<td>Y. H. ED</td>
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<td>High</td>
<td>38</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>International Culture</td>
<td></td>
</tr>
<tr>
<td>M. T. ED</td>
<td>108</td>
<td>High</td>
<td>43</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>Y. N. ED</td>
<td>106</td>
<td>High</td>
<td>18</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>International Culture</td>
<td></td>
</tr>
<tr>
<td>R. O. ED</td>
<td>115</td>
<td>High</td>
<td>43</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>International Culture</td>
<td></td>
</tr>
<tr>
<td>Y. A. ED</td>
<td>105</td>
<td>High</td>
<td>12</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Y. M. ED</td>
<td>80</td>
<td>Low</td>
<td>19</td>
<td>High</td>
<td>M</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>K. Y. ED</td>
<td>89</td>
<td>Low</td>
<td>21</td>
<td>High</td>
<td>F</td>
<td>K</td>
<td>Agriculture</td>
<td></td>
</tr>
<tr>
<td>M. N. ED</td>
<td>46</td>
<td>Low</td>
<td>11</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>J. S. ED</td>
<td>69</td>
<td>Low</td>
<td>17</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>T. H. ED</td>
<td>41</td>
<td>Low</td>
<td>6</td>
<td>Low</td>
<td>F</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
<tr>
<td>N. S. (M) ED</td>
<td>33</td>
<td>Low</td>
<td>12</td>
<td>Low</td>
<td>M</td>
<td>T</td>
<td>English</td>
<td></td>
</tr>
</tbody>
</table>

*Note. DT = dictionary type; Vocab = Vocabulary Levels Test; VG = vocabulary group; RG = reading group*

Table 3.13: Demographic Information for the Participants in the Second Phase
"t"-Tests were performed in order to examine whether there were differences between the two dictionary groups from Phase 2 in their vocabulary size and reading ability. The results indicate that there were no differences between the two groups in their scores on the Vocabulary Levels Test, \( t(15.916) = 1.079, p = .297 \), or the TOEFL, \( t(20) = -.195, p = .848 \). However, the mean scores indicate that the PD group performed slightly better on the Vocabulary Levels Test than the ED group (93.91, 82.36, respectively). The results of the \( t \)-tests are presented in Table 3.14.

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>( n )</th>
<th>Mean</th>
<th>( SD )</th>
<th>( t )-Value</th>
<th>( df )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED</td>
<td>11</td>
<td>82.36</td>
<td>30.810</td>
<td>1.079</td>
<td>15.916</td>
<td>.297</td>
</tr>
<tr>
<td>PD</td>
<td>11</td>
<td>93.91</td>
<td>17.632</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOEFL</td>
<td>( n )</td>
<td>Mean</td>
<td>( SD )</td>
<td>( t )-Value</td>
<td>( df )</td>
<td>( p )</td>
</tr>
<tr>
<td>ED</td>
<td>11</td>
<td>21.82</td>
<td>13.288</td>
<td>-.195</td>
<td>20</td>
<td>.848</td>
</tr>
<tr>
<td>PD</td>
<td>11</td>
<td>20.82</td>
<td>10.685</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.14: Comparison Between Two Dictionary Groups According to Scores on the Vocabulary Levels Test and the TOEFL for 22 Students

The median split of the students’ scores on the Vocabulary Levels Test was used to divide them into large- and small-vocabulary groups. The results of \( t \)-tests confirmed that the two vocabulary-size groups significantly differed in their scores on the Vocabulary Levels Test, \( t(11.378) = -6.254, p = .000 \). The two groups also differed on their scores of the TOEFL; the large-vocabulary group scored higher than the small-vocabulary group, \( t(15.218) = -3.629, p = .002 \). The results of the \( t \)-tests are summarized in Table 3.15.
Table 3.15: Comparison Between Two Vocabulary-Size Groups According to Scores on the Vocabulary Levels Test and the TOEFL for 22 Students

Similarly, the median split of the students’ scores on the TOEFL was used to divide students into high- and low-reading-ability groups. The results of \( t \)-tests confirmed that the two reading-ability groups significantly differed in their scores on the TOEFL, \( t(13.774) = -5.300, p = .000 \). The two groups also differed in their scores on the Vocabulary Levels Test; the high-reading-ability group scored higher than the low-reading-ability group, \( t(20) = -3.405, p = .003 \). The results of the \( t \)-tests appear in Table 3.16.

Table 3.16: Comparison Between Two Reading-Ability Groups According to Scores on the Vocabulary Levels Test and the TOEFL for 22 Students

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>( n )</th>
<th>Mean</th>
<th>( SD )</th>
<th>( t )-Value</th>
<th>( df )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>LV</td>
<td>12</td>
<td>106.83</td>
<td>7.791</td>
<td>-6.254</td>
<td>11.378</td>
<td>.000</td>
</tr>
<tr>
<td>SV</td>
<td>10</td>
<td>65.70</td>
<td>19.545</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOEFL</td>
<td>( n )</td>
<td>Mean</td>
<td>( SD )</td>
<td>( t )-Value</td>
<td>( DF )</td>
<td>( P )</td>
</tr>
<tr>
<td>LV</td>
<td>12</td>
<td>27.67</td>
<td>12.138</td>
<td>-3.629</td>
<td>15.218</td>
<td>.002</td>
</tr>
<tr>
<td>SV</td>
<td>10</td>
<td>13.70</td>
<td>5.034</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As the high correlation between the scores on the Vocabulary Levels Test and the TOEFL \((r = .715)\) suggests, the two vocabulary-size groups and the two reading-ability groups overlapped. Namely, those with a large vocabulary were also high in reading ability, whereas those with a small vocabulary were low in reading ability. However, there were three students who belonged to the high-proficiency group in vocabulary size but the low-proficiency group in reading ability, and there were three other students who belonged to the high-proficiency group in reading ability but the low-proficiency group in vocabulary size (see Table 6).

The results of qualitative analyses of retrospective think-aloud protocols and interview data were discussed according to two proficiency groups (i.e., high-proficiency and low-proficiency) by combining the two vocabulary-size groups and the two reading-ability groups. For the qualitative analysis, the six students who belonged to different proficiency groups in reading ability and vocabulary size were treated separately.

**Instrumentation**

This study used multiple investigative techniques. Previous studies on language learning strategies, including LPSs, have used various investigative procedures, such as written questionnaires, interviews, observations, think-aloud methods, diaries and journals, and computer tracking. From this wide range of procedures, a structured written questionnaire, semi-structured interviews, and a retrospective think-aloud method were chosen as the main investigative techniques for this study, taking into account their reliability, validity, appropriateness for research purposes, and feasibility. This study combined the three methods to highlight their strengths and reveal a more complete picture of learners’ use of dictionaries.
First of all, a written questionnaire was chosen as one of the methods. In order to make its findings relevant to other learners in similar contexts, a study should include a sufficient number of students with different backgrounds in terms of proficiency level, vocabulary size, and learning style or preference. A written questionnaire is appropriate for this purpose; it is relatively easy to administer and can involve large groups of students at various sites (Cohen, 1998). Furthermore, since a researcher has relative control over the shape of the response, the data elicited from a structured questionnaire is uniformly organized and can be statistically analyzed (Cohen, 1998). However, the responses to a structured questionnaire may be not only simplistic or brief but also limited to foreseen topics (Cohen, 1998).

In order to lessen these drawbacks of a written questionnaire and obtain broader, more detailed information, a second method, semi-structured interviews, were also conducted with the students selected from those who completed the written questionnaire. Whereas both a written questionnaire and interviews are capable of obtaining students’ generalized statements about learning behavior, they share the limitation that they may elicit ambiguous and less accurate data because they ask about strategy use out of context and depend solely on learners’ self-reports (Cohen, 1998). Learners may differ in how they interpret question items. Moreover, they may overestimate or underestimate their use of strategies. Furthermore, they may alter their responses according to social desirability, that is, what they believe they are supposed to do.

In order to overcome this problem, a third method, a retrospective think-aloud procedure, was used. Think-aloud methods may provide more unambiguous and accurate data because they require learners to describe their use of strategies at the time that
learners are performing a task (Cohen, 1998). Think-aloud methods have been criticized due to the potential that they may distort cognitive processes (Cohen, 1998; Gass & Mackey, 2000). However, they are the best available means to find out what is happening in the learner’s mind (Cohen, 1998; Gass & Mackey, 2000; Gu, 2003). Furthermore, since this study used a written questionnaire and interviews in addition to a think-aloud method and triangulated the findings through the three methods to understand learners’ use of dictionaries, the intrusive nature of think-aloud methods did not seem to affect the findings significantly. A retrospective think-aloud method was chosen over a concurrent think-aloud method because it offers a richer source of information by allowing a learner to analyze what they are thinking and interpret why they are doing something (Cohen, 1998). Also, retrospective think-aloud procedures are generally easier to carry out than concurrent think-aloud procedures. For concurrent think-aloud procedures, learners need more practice to perform a task and simultaneously verbalize their thoughts (Gass & Mackey, 2000).

Questionnaire

A three-part written questionnaire was used to elicit the students’ use of EDs, PDs, and other LPSs (see Appendix J). The researcher adapted it mainly from Gu and Johnson’s (1996) study. Whereas Gu and Johnson were interested in a comprehensive set of vocabulary learning strategies, including both “discovery strategies” (strategies useful for the initial discovery of a word’s meaning) and “consolidation strategies” (strategies useful for remembering that word once it has been introduced) (Schmitt, 1997), the researcher focused on LPSs, which only include “discovery strategies.” Also, she was concerned with students’ EDs. Therefore, she discarded or revised some items in Gu and
Johnson’s (1996) questionnaire and added new items by drawing on Fan (2003), Kojic-Sabo and Lightbown (1999), Koyama & Takeuchi (2004), and Tang (1997). The questionnaire included 85 closed items (Likert-scale items, yes-no items, and multiple-choice items), 2 open-ended items, and 5 items on background information. The questionnaire was written in the students’ native language, Japanese, so that they could complete it within a reasonable time and understand it well with minimal confusion.

Part 1 of the questionnaire asked about the features of the students’ EDs such as brands, costs, perceived strengths and weaknesses. It also included items on their use of EDs as compared with PDs such as: whether they owned EDs; how often they used EDs relative to PDs; and for what purposes they used EDs and PDs.

Items 1-4 of Part 2 asked the students about the frequency in their use of dictionaries, whether PDs or EDs. These items also asked about the use of other types of electronic dictionaries. Item 5 of Part 2 required the students to indicate their frequency of use in each of 68 LPSs on a five-point scale: never or almost never true of me; generally not true of me; somewhat true of me; generally true of me; and always or almost always true of me. This item asked the students about their dictionary use and skills. In order to find out how dictionaries were used in combination with other LPSs, the students were also asked about their use of other LPSs, such as inferencing, ignoring, and asking others. Of 68 LPSs under Item 5, 61 strategies were grouped into 13 categories, and 7 strategies that could not be grouped were treated individually (see Appendix K).

Part 3 of the questionnaire elicited background information such as the students’ demographic information (age, major, gender, etc.), scores on any standardized tests
available, and the amount of time they spend on vocabulary learning and English learning in general.

Table 3.17 lists the 13 LPS categories in Item 5 of Part 2, their abbreviations, the number of items under each category, and the internal consistency reliability of each category. Among the 13 categories, basic dictionary use includes dictionary use for definitions, pronunciation, and part of speech. Extended dictionary use for meaning, usage, and grammatical information involve dictionary use beyond basic information regarding meaning (e.g., looking for synonyms), usage (e.g., looking for collocations), and grammar (e.g., looking for the sentence patterns in which the word can be used), respectively. Dictionary use for vocabulary learning includes dictionary use for enhancing vocabulary knowledge rather than for comprehension (e.g., scanning nearby entries of the unknown word out of curiosity). Lookup strategies (skills) involve strategies or skills needed for successful consultation (e.g., removing the inflections to recover the base form to look up). Self-initiation includes LPS use in an independent activity (e.g., looking up an unknown word when reading for pleasure). Note-taking strategies involve writing a note about information discovered about a word. Two types of guessing strategies were distinguished: guessing strategies using immediate context (within the same sentence) and guessing strategies using wider context (across the sentence). Combined use of LPSs involves the use of multiple LPSs on one word (e.g., consulting a dictionary to confirm guessed meaning). Selective use of LPSs includes a decision to use a certain LPS over others according to the word’s nature (e.g., looking up a word necessary for comprehension). Social strategies include the strategies of consulting others.
<table>
<thead>
<tr>
<th>LPS categories</th>
<th>Abbreviations</th>
<th>No. of Items</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic dictionary use</td>
<td>BDU</td>
<td>4</td>
<td>.663</td>
</tr>
<tr>
<td>Extended dictionary use for meaning</td>
<td>EDUM</td>
<td>3</td>
<td>.663</td>
</tr>
<tr>
<td>Extended dictionary use for usage</td>
<td>EDUU</td>
<td>6</td>
<td>.734</td>
</tr>
<tr>
<td>Extended dictionary use for grammatical information</td>
<td>EDUGI</td>
<td>3</td>
<td>.751</td>
</tr>
<tr>
<td>Dictionary use for vocabulary learning</td>
<td>DUVL</td>
<td>4</td>
<td>.618</td>
</tr>
<tr>
<td>Lookup strategies (skills)</td>
<td>LS</td>
<td>5</td>
<td>.782</td>
</tr>
<tr>
<td>Self-initiation</td>
<td>SI</td>
<td>2</td>
<td>.536</td>
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<tr>
<td>Note-taking strategies</td>
<td>NTS</td>
<td>5</td>
<td>.708</td>
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<td>Guessing strategies using wider context</td>
<td>GSUI</td>
<td>9</td>
<td>.901</td>
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<td>Guessing strategies using immediate context</td>
<td>GSUW</td>
<td>5</td>
<td>.840</td>
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<tr>
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<td>CULPS</td>
<td>2</td>
<td>.512</td>
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<td>SULPS</td>
<td>9</td>
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<tr>
<td>Social strategies</td>
<td>SS</td>
<td>2</td>
<td>.601</td>
</tr>
</tbody>
</table>

Table 3.17: 13 LPS Categories

**Reading Comprehension Section of the TOEFL**

A subsection of the Test of English as a Foreign Language (TOEFL), Section 3, Reading Comprehension, was used to assess the students’ reading ability. With the permission of Educational Testing Service (ETS), the test was adopted from the *TOEFL Test Preparation Kit* (2003), which contains the questions from previously administered paper-based TOEFL tests. The Reading Comprehension Section requires reading five short passages on various topics and answering questions about them. It includes 50 items in total, and the time limit is 55 minutes. The questions ask about “information that is stated in or implied by the passage, as well as knowledge of some of the specific words” (*TOEFL Test Preparation Kit, 2003*).

**Vocabulary Levels Test**

A longer version of the Vocabulary Levels Test (Schmitt, 2000; Schmitt, Schmitt, & Clapham, 2001) was used to determine participants’ vocabulary size (see Appendix L).
The Vocabulary Levels Test was originally designed by Nation (1990) as a diagnostic vocabulary test. Schmitt revised it (Version A) and wrote three additional versions (Versions, B, C, and D). Then, he combined Versions A and B into a single test (Version 1) and Versions C and D into Version 2. Recognizing the problem that the original Vocabulary Levels Test has “never been properly validated” (p. 55), Schmitt et al. (2001) demonstrated the validity of Versions 1 and 2 by using a range of analysis techniques. A longer version of the test (Version 2) was used in the study.

The Vocabulary Levels Test was chosen because it is widely used to assess learners’ vocabulary sizes for research and pedagogical purposes and participants’ scores on the test can be evaluated by comparing them with those of other groups of students. Also, the test has high practicality. The Vocabulary Levels Test is designed “to be quick to take, easy to mark and easy to interpret” and requires minimal effort from both test takers and administrators (Nation, 2001, p. 21).

The test contains words at five frequency levels: 2,000, 3,000, 5,000, 10,000, and academic level. Each item of the test requires a test taker to match six words to three definitions. A longer version of the test contains 60 words and 30 definitions at each level and includes 150 items in total. Partial knowledge of words receives credits; since the option words have different meaning senses, even a vague idea of a word’s meaning sense enables a test taker to match the word to the correct meaning sense (Schmitt, 2000). The reliability of Version 2 for all levels ranges between .922 and .960 (Schmitt et al., 2001).
Retrospective Think-aloud Protocols

Retrospective think-aloud protocols were collected from the 22 students during a reading session in order to examine the use of dictionaries and other LPSs in more detail. All instructions and probes in the reading session were given in Japanese. A reading task was chosen because previous studies (Béjoint, 1981; Tomaszczyk, 1979) indicate that L2 learners use a dictionary most frequently when they are engaged in a reading task. In the reading session, they read a short passage using either an ED or a PD.

They were asked to read the short passage as they usually did. Students first read comprehension questions, read a short passage, and answered the comprehension questions. Next they skimmed the passage and circled unknown or partially known words with which they had difficulties.

Then, the students engaged in structured retrospective think-aloud interviews. Roughly the same set of questions was asked of all the students (see Appendix M). For each unknown or partially known word, they were asked to report what LPS(s) they used, why they used it, and what meaning was determined when either inferencing or consulting was used. Additionally, when the students consulted a dictionary, they were also asked whether they found useful information about the word besides meanings.

The text used in the reading session came from the Japan Times (a weekly newspaper for English learners published in Japan) (Hards, 2004; see Appendix N). The text discusses the impact of new diseases such as avian flu, BSE, and SARS on society. It contains 517 words and has a readability level of 10.4 determined by the Fresch-Kincaid index. The text was selected to be similar to those that they normally read in terms of
length, difficulty level, and genre. Since students were in different fields of study, the topic of the article was general so that it would not favor particular students.

**Comprehension Questions**

Six open-ended comprehension questions in Japanese based on the reading passage were created by the researcher to measure the students’ level of comprehension and to make sure that the students read the passage for comprehension (see Appendix O). These questions aimed at assessing an overall understanding of the text rather than an understanding of individual words or structures.

**Cued Recall Test**

A cued recall test was administered a week after the reading session (see Appendix P). The test required supplying definitions for all the words that each student indicated to be unknown or difficult in the reading session. The test was tailored to individual students, and the words appearing on the test were different for each student.

**Multiple-Choice Vocabulary Test**

A multiple-choice vocabulary test was also administered a week after the reading session (see Appendix Q). The test consisted of 5 words that all the students indicated to be unknown or difficult in the reading session (i.e., *avian*, *fearmonger*, *level-headed*, *pneumonia*, and *squeal*), along with 8 other words appearing in the text, and required matching the 13 words to their Japanese equivalents by choosing from 20 alternatives.

**Interviews**

The 22 students were also asked to participate in semi-structured follow-up interviews concerning the questionnaire. The purposes of the follow-up interviews were twofold: (1) to supply details to their responses to the questionnaire and clarify any
ambiguities and (2) to understand students’ LPS use holistically in comparison with other vocabulary learning strategies. The interviews were conducted in Japanese. An interview guide constructed by the researcher was used (see Appendix R). In the interviews, the students were asked not only about LPS use but also about the use of other vocabulary learning strategies.

Although a similar set of questions was asked of all the students according to the interview guide, the interviews were also individualized in that they were based on the students’ responses on the questionnaire; the researcher asked the students to elaborate their responses on the questionnaire, which she had difficulty interpreting or would like to elicit more information about.

**Procedures**

**Pilot Study**

In spring 2004, the written questionnaire and the Vocabulary Levels Test were piloted with several Japanese students at a Midwestern university in the US. The findings from this phase of the pilot study were used to determine the time required for completing the questionnaire and the Vocabulary Levels Test, and modify the questionnaires according to students’ responses by eliminating ambiguous or misleading wordings. A few days later, the same students also participated in follow-up interviews to determine the time to be allocated for interviews and identify any problems with the interview guide.

The retrospective think-aloud technique used in the reading session was also piloted with several Japanese students at the Midwestern university. The students were asked to read the passage used in this study, answer comprehension questions, and
participate in retrospective think-aloud interviews where they reported on their LPS use by answering the same set of questions as those used in this study. The findings of this phase of the pilot study were used to determine the time to be allocated for the retrospective think-aloud interviews and detect any problems with the think-aloud procedure and the probes. Furthermore, they helped determine the appropriateness of the reading passages in terms of difficulty level and topic for the participants of this study and the validity of comprehension questions.

**Phase 1 of the Study**

Prior to the administration of the questionnaire, the participants at the three universities completed the TOEFL and the Vocabulary Levels Test. The students at all three universities completed the Vocabulary Levels Test using 35 minutes of a regular class period. Another day, the students at T University and N University also took the TOEFL, using 55 minutes of the class time. However, since the students at K University were in oral communication classes, the instructor decided that it was inappropriate to administer the Reading Comprehension section of the TOEFL in class, and asked the students to complete it as a homework assignment. Although these students completed the TOEFL at home, they received detailed instructions on how to take the test (e.g. allocated time, no use of reference materials) and were asked to strictly follow the instructions.

In mid May 2004, students filled out the questionnaire about LPS use during the class period at their universities. The researcher was present in the classroom while the students were completing the questionnaire in order to ensure that those at the three universities would complete the questionnaire in the same conditions. At the beginning of
the class, the researcher distributed the questionnaire and provided the students with brief instruction on how to complete them. The researcher noted that their participation was voluntary and they were free to refuse to participate in the study. The researcher also explained to the students about Phase 2 of the study, invited them to participate in this phase, and asked them to indicate their willingness to participate in this phase under the corresponding item on the questionnaire. Then, the students filled out the questionnaire. Whenever they had questions, they raised their hands and asked the researcher. The questionnaire took 20-30 minutes to complete.

**Phase 2 of the Study**

Among the Phase 1 participants, the 22 students were selected to participate in Phase 2 based on their responses to the questionnaire and their scores on the Vocabulary Levels Test and the TOEFL. From late May to mid June, the 22 students individually met the researcher for 80-120 minutes to participate in the reading session and the follow-up interview. They were asked to bring to the meeting the dictionary that they usually used, whether an ED or a PD. Before the reading session, the students received 10-15 minutes of training, so that they could become familiar with the retrospective think-aloud procedure. In the training session, they read a paragraph of text, which was taken from the *Student Times* and was similar to that used in the reading session in terms of genre and difficulty, and they reported on the LPS(s) used to deal with each unknown or partially known word by answering the same set of questions as those asked in the reading session.

After the training, the students engaged in the reading session, where they first read the short passage using an ED or a PD within 40 minutes. The researcher kept notes
about the students’ salient LPS use while they were reading the text. Next, they orally answered comprehension questions. Then, they were asked to circle unknown or partially known words that they came across while reading the text. After this, they reported on their overall use of LPSs and reading strategies, such as how many times they read the text, when they consulted a dictionary (e.g., immediately, after reading the sentence containing an unknown word, after reading the paragraph containing it, after reading the whole text, etc.), and whether they jotted down the information found in the dictionary. Finally, they reported on the use of LPSs used for each unknown or partially known word. When the students were quiet, the researcher prompted their reports by using notes that she kept while they were reading the text. The reading session was audio-taped. The session took 50-70 minutes to complete.

Subsequently, the students participated in the follow-up semi-structured interview concerning the questionnaire. During the interviews, the researcher took notes of what she noticed. The interviews were audio-taped. Each interview lasted 20-30 minutes.

A week later, a booklet consisting of the cued recall test, the multiple-choice vocabulary test, and detailed instructions on how to complete them, was mailed to the students. They were asked to complete the tests within three days from receiving them. They were also asked to indicate the date of the completion and the time needed to complete the tests on the front page. They were first required to complete the cued recall test without looking at the multiple-choice test and then required to move to the multiple-choice test.
Data Analysis

Phase 1 of the Study

For all of the analyses, SPSS for Windows version 12 was used. The $\alpha$ level was set at .05. Percentages were used to analyze the students’ responses on Section 1 and on Items 1-4 on Section 2 of the questionnaire. In addition to percentages, Chi-square tests were used to compare the ED and PD groups for Items 1, 2, and 4 of Section 2. These analyses included all 279 students.

Means, correlations, and two sets of two-way ANOVAs were used to analyze students’ responses on Item 5 of Section 2. These analyses included only 226 students who completed all three instruments: the questionnaire, the vocabulary test, and the reading test. In the first analysis, the mean score of all the students was calculated for each of the 13 LPS categories and 7 individual items, in order to reveal an overall picture of LPS use by dealt with individually the students.

In the second analysis, correlation coefficients were calculated in order to examine the relationships of LPS use with dictionary type, vocabulary size, and reading ability. A point-biserial correlation coefficient was calculated between dictionary type and scores for each of the 13 LPS categories and 7 individual items, because one of the variables (dictionary type) is nominal. Additionally, a Pearson product-moment correlation coefficient was calculated between Vocabulary Levels Test scores and scores for each of the 13 LPS categories and 7 individual items, because both variables can be considered to be rational. Similarly, a Pearson product-moment correlation coefficient was calculated between TOEFL scores and scores for each of the 13 LPS categories and 7 individual items for the same reason.
Third, two sets of two-way ANOVAs were carried out in order to compare the groups (ED and PD, large vocabulary and small vocabulary, high reading ability and low reading ability) in their LPS use. Prior to performing the ANOVAs, the assumptions, such as normal distributions and equal variances, were carefully checked. One set of two-way ANOVAs was carried out with dictionary type (ED and PD) and vocabulary-size group (large and small) as independent variables and the mean score for each of the 13 LPS categories and individual items as a dependent variable. The other set of two-way ANOVAs was performed with dictionary type (ED and PD) and reading-ability group (high and low) as independent variables and the mean score for each of the 13 LPS categories and individual items as a dependent variable.

Additionally, two sets of one-way ANOVAs using the students’ test scores as covariates were carried out in order to ensure that the differences between the ED and PD groups in vocabulary size and/or reading ability within each vocabulary-size group did not influence the results of the above two-way ANOVAs. One set of one-way ANOVAs comparing the ED and PD groups within the small-vocabulary group was performed with dictionary type as an independent variable, the mean score for each of the 13 LPS categories and individual items as a dependent variable, and the students’ Vocabulary Levels Test scores as covariates. The other set of one-way ANOVAs comparing the ED and PD groups within the large-vocabulary group was performed with dictionary type as an independent variable, the mean score for each of the 13 LPS categories and individual items as a dependent variable, and the students’ Vocabulary Levels Test scores and TOEFL scores as covariates.
**Phase 2 of the Study**

For all of the statistical analyses, SPSS for Windows version 12 was used. The α level was set at .05. The retrospective think-aloud protocols collected from the 22 students were transcribed by the researcher. The researcher and a former Japanese EFL teacher separately coded the protocols in order to discover the LPS(s) that the students used to deal with each unknown or partially known word and evaluated a determined meaning when consulting or inferencing was used. The researcher and the second coder resolved any disagreements through discussion with each other and another former Japanese EFL teacher, who was also a PhD candidate in Second Language Education.

The LPSs that the students used for unknown or partially known words were determined based on the following operational definitions: consulting (using a dictionary even if a student fails to find the information that he/she is looking for), inferencing (coming up some meaning of an unknown word before or without consulting a dictionary), and ignoring (neither consulting nor guessing). The intercoder agreement was 94.9%.

The mean rates of use of the three LPS options based on the total number of unknown or partially known words were calculated for the whole sample. Then, correlation coefficients were calculated in order to investigate the relationships of the rates of use of the three LPS options with dictionary type, vocabulary size, and reading ability. Point-biserial correlation coefficients were calculated between the rates of use of the three LPS options and dictionary type. Pearson product-moment correlation coefficients were calculated between both the rates of use of the three LPS options and
Vocabulary Levels Test scores, and the rates of use of three LPS options and TOEFL scores.

Next, three sets of $t$-tests were performed in order to examine whether there were any differences between the groups (ED and PD, large vocabulary and small vocabulary, high reading ability and low reading ability) in the mean rates of use of the three LPS options. Prior to performing these $t$-tests as well as subsequent $t$-tests discussed below, assumptions, such as normal distributions and equal variances, were carefully checked. In the cases where there was a concern about the violation of these assumptions, the results were interpreted with caution in association with those of correlational analyses and other descriptive analyses, and those of supplementary $t$-tests performed without outliers.

The first set of $t$-tests comparing the groups in the mean rates of use of the three LPS options was carried out in order to examine whether there were any differences between the two dictionary groups (ED and PD). The second set of $t$-tests compared the two vocabulary-size groups (large and small). The third set of $t$-tests compared the two reading-ability groups (high and low).

When either consulting or inferencing was used, determined meanings were evaluated using a three-point scale: no comprehension (no or an inappropriate meaning was determined), partial comprehension (the determined meaning worked generally for the text context although there was some distortion or loss of the text representation), and comprehension (the determined meaning was appropriate for the text context with little or no meaning distortion) (Fraser, 1999a). The inter-rater agreement was 87.9%.

The mean success rates (both the full-success rates and the full or partial success rates) of determining word meanings associated with the use of the two LPS options (i.e.,
consulting and inferencing) were calculated for the whole sample. Then, correlation coefficients were calculated in order to investigate the relationships of the mean success rates of determining word meanings with dictionary type, vocabulary size, and reading ability. Point-biserial correlation coefficients were calculated between the mean success rates of determining word meanings and dictionary type. Pearson product-moment correlation coefficients were calculated between both the mean success rates of determining word meanings and Vocabulary Levels Test scores, and the mean success rates of determining word meanings and TOEFL scores.

Next, the mean success rates of word meanings of the ED and PD groups were compared, using t-tests. Similarly, the mean success rates of the large- and small-vocabulary groups, and those of the high- and low-reading-ability groups, were compared using t-tests.

The researcher and the same second rater separately scored the comprehension test. Each of six items was scored by assigning 0 for no response or an incorrect response, .5 for a partially correct response, and 1 for a correct response. Each student’s score was calculated by adding the scores of six items. The inter-rater agreement was 93.2%.

A mean comprehension score was calculated for the whole sample. Then, a point-biserial correlation coefficient was calculated between comprehension scores and dictionary type. Pearson product-moment correlation coefficients were also calculated between both comprehension scores and Vocabulary Levels Test scores, and comprehension scores and TOEFL scores.
Next, the mean comprehension scores of the ED and PD groups were compared using a t-test. The mean comprehension scores of the large- and small-vocabulary groups, and those of the high- and low-reading-ability groups, were also compared using t-tests.

The items on the cued recall vocabulary test were scored using the same three-point scale as those used for evaluating meanings determined during the reading session: no comprehension (no or an inappropriate meaning was determined), partial comprehension (the determined meaning worked generally for the text context although there was some distortion or loss of the text representation), and comprehension (the determined meaning was appropriate for the text context with little or no meaning distortion) (Fraser, 1999a). The mean rates of recall (the mean rate of successful recall and the mean rate of successful or partially successful recall) were calculated for the whole sample.

The researcher scored each item on the multiple-choice vocabulary test by assigning 1 for a correct answer and 0 for an incorrect answer. Each student’s score was calculated by adding points for six items. The mean score was calculated for the whole sample.

Then, point-biserial correlation coefficients were calculated between the students’ scores on these vocabulary tests and dictionary type. Pearson product-moment correlation coefficients were calculated between both the students’ scores on these tests and Vocabulary Levels Test scores, and their scores on these tests and TOEFL scores.

Next, the means scores of the PD and ED groups on these tests were compared using a t-test. The mean scores of the two vocabulary-size groups and those of the two reading-ability groups were also compared using t-tests.
In addition to these statistical analyses, the researcher also coded the retrospective think-aloud protocols based on grounded theory in order to identify in what context the students used LPSs. Ground theorists attempt “to identify categories and concepts that emerge from text and link these categories into substantive and formal theories” (Ryan & Bernard, 2000, p. 782). For coding categories, the researcher consulted the literature on LPS use and vocabulary learning strategy use (e.g., Fan, 2003; Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Schmitt, 1997); however, she was also open to the categories or concepts that emerged from the data. The researcher read the transcripts line by line to identify concepts and themes. As coding categories emerged, she built models indicating the relationships among them. The models were tested against the data, including those that did not fit them, and made appropriate revisions. Finally, the researcher transcribed the interview data. The interview data were coded in comparison with the questionnaire data so that the interview data could help explain why the students responded to the items on the questionnaire in the ways they did. These analyses were also based on grounded theory. Although the researcher derived coding categories from the literature on LPS use and vocabulary learning strategy use (e.g., Fan, 2003; Gu, 2003; Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Schmitt, 1997), she also derived them from the data. The researcher read the transcripts line-by-line to identify categories and concepts. Then, she built models indicating the relationships among them and tested the models against the data.
CHAPTER 4

RESULTS AND DISCUSSION

This chapter organizes the results of the study into three sections, one for each of the three methodological components. Each section includes the results from each methodological component and a discussion of the results. First, this chapter reports the results from the questionnaire data, which were analyzed quantitatively, and then discusses the results. Next, it summarizes the results from the retrospective think-aloud protocols elicited during the reading session, the reading test administered during the reading session, and the vocabulary tests administered one week after the reading session, which include both quantitative and qualitative data. It then discusses the results of this component. Finally, this chapter presents the results from the interview data, which were analyzed qualitatively, followed by a discussion of the results.

Questionnaire Results

This section first presents the results from the questionnaire data, which were quantitatively analyzed. Then, it discusses the results in comparison with other studies.

Data Analysis

The results from the questionnaire data are provided in this section. The first subsection provides the results of Section 1 and Items 1-4 of Section 2, which were analyzed mainly using percentages. The subsequent three subsections summarize the
analyses of students’ responses to Item 5 of Section 5, including descriptive analysis (i.e., means, standard deviations), correlational analysis, and two-way ANOVAs.

**Use of EDs and PDs.** This section presents the results of Section 1 and Items 1-4 of Section 2 on the questionnaire, which required students to mark the one or ones that best describe their lexical processing strategy (LPS) use among multiple alternatives. The results presented here came from 279 students who completed a questionnaire, including those who did not complete a Vocabulary Levels Test or the TOEFL, because the analysis did not include the comparisons between two vocabulary-size groups and readability groups. The data were analyzed using statistics, such as percentages and Chi-square tests.

Overall, seventy-two percent of the 279 students owned a pocket electronic dictionary (ED); however, when including only English and English-related majors in the analysis, the percentage of ownership was slightly higher (78%). Many of those who did not own an ED reported that they did not own one because of the high cost. Also, some students reported that they did not own an ED because they thought that a printed dictionary (PD) contained more information than an ED, because they were satisfied with their PDs, or because they were accustomed to their PDs.

Those who owned an ED appeared to prefer it greatly to a PD. Seventy-five percent of ED owners primarily used an ED, and an additional 16 % used an ED more often than a PD, although they also owned a PD. Only 31% of ED owners used a PD and an ED for different purposes. These findings suggest that students tended not to use a PD once they had an ED. Those who used these two types of dictionaries for different purposes used an ED to find out a word’s meaning quickly and used a PD to look at
examples or detailed usage information (65%) and detailed grammatical information (54%). Furthermore, some of them used an ED at school and used a PD at home (27%).

The EDs owned by most students were quite expensive and cost between ¥10,000 and ¥40,000 (approximately $100 and $400). Upon examination by the researcher against Harmann’s (1992) criteria, their EDs did not have the deficiencies in quality identified by previous studies (Tang, 1997; Taylor & Chan, 1994). Due to recent improvements, students’ EDs provided detailed grammatical and usage information; many of them were equipped with the full contents of PDs. Students’ high level of satisfaction with their EDs may be the result of the improved quality of the EDs; in other words, the majority of ED owners were either satisfied (41%) or somewhat satisfied (50%) with their EDs.

The most popular brand of students’ EDs was Casio (53%). Less popular brands included Seiko (16%), Sharp (14%), and Canon (5%). Students’ EDs contained multiple dictionaries. They included English dictionaries, such as an English-Japanese dictionary (100%), a Japanese-English dictionary (98%), a thesaurus (65%), and a monolingual English dictionary (43%). Additionally, some students filled in the blank by naming dictionaries of other languages such as a Japanese dictionary, a classical Japanese dictionary, a German dictionary, a French dictionary, and a Chinese dictionary.

The perceived strengths of EDs included portability (91% of ED owners), the quickness/ease of looking up a word (90%), the ease in changing from one dictionary to another (71%), and the capability of looking up a word whose spelling was uncertain (36%). As write-in answers, some students also pointed out the capability of recording
the words looked up, the availability of an idiom search function, the availability of an example search function, the capability of adding dictionaries by inserting cards, and the availability of multiple dictionaries and practice exercises.

On the other hand, the perceived disadvantages of EDs included the unavailability of diverse examples (39% of ED owners), the lack of detailed grammatical information (32%), the lack of usage information (27%), their small screens (19%), the limited number of headwords (16%), and their breakability (9%). Some students filled in the blank by giving additional perceived disadvantages, such as the difficulty of use, the unavailability of a sound function, the unavailability of illustrations, a limited number of idioms, the inability to create a notion, and the ineffectiveness for word retention.

These perceived problems with the quality of EDs, which are contradictory to the researcher’s observation, may be explained by the interface design of EDs (Koyama & Takeuchi, 2003, 2004). Since EDs do not allow the entire entry to be viewed at once due to their small screens, students have to scroll or tap to different screens for detailed information. Therefore, EDs might have given students the impression that such information was not available.

The percentage of students who marked each of the perceived disadvantages was very low compared with the percentage of those who marked each perceived advantage; some students even left this section completely blank. Again, this suggests that students were highly satisfied with their EDs.

Whether an ED or a PD, 17% of the students reported using a dictionary daily, 24% of the students 4 or 5 times a week, 33% of the students 2 or 3 times a week, 4% of the students once a week, and the other 22% of the students less frequently. When
looking at these percentages separately, ED users appeared to use a dictionary more frequently than PD users. The results of a Chi-square test ($\alpha = .05$) indicated that a higher percentage of the ED users (51% as opposed to 22% of the PD users) consulted a dictionary more often than 2 or 3 times a week, and that a higher percentage of PD users (37% as opposed to the 14% of the ED users) used it less than once a week, $\chi^2(5) = 28.647$, $p = .000$.

On the whole, 26% of the students reported consulting a dictionary for more than 90% of unknown words, 27% for 70-90% of unknown words, 30% for 50-70% of unknown words, and 17% for less than 50% of unknown words, when they were reading a text to prepare for their English classes. For these percentages, no differences were found between ED and PD users. Along with the above finding that ED users consulted a dictionary more often than PD users on a weekly basis, this finding may suggest that EDs are more helpful for increasing the number of instances where a dictionary is taken out rather than for increasing the number of times that the dictionary is used during each instance (where a dictionary is taken out).

The majority of students rarely used other types of electronic dictionaries such as a CD-ROM dictionary and an online dictionary. As a whole, 97% of the students had never used a CD-ROM dictionary and an additional 2% of the students used it less than once a week. Eighty-six percent of the students had never used an online dictionary and an additional 9% of the students used an online dictionary less than once a week.

Overall, 89% of the students used a dictionary at home, 87% in class, and 25% in the library. ED users appeared to use a dictionary at school more often than PD users.
The results of a Chi-square test indicated that a higher percentage of ED users (92% as opposed to 78% of the PD users) consulted a dictionary in class, \( \chi^2(1) = 10,854, p = .001 \).

Less than half (41%) of all the students reported having received training in dictionary use at school. However, many of the students were “confident” (13%) or “neither confident or unconfident” (61%) about their dictionary skills. Only 25% of the students were not confident. This may suggest that although they had not received any systematic training in dictionary use at school, many of the students acquired dictionary skills on their own.

In summary, EDs seem to have become a popular tool for Japanese learners of English. The majority of students owned an ED, and those who owned it appeared to prefer it greatly to a PD. Most of the EDs owned by the students were expensive and of high quality. Although some ED owners recognized several limitations, most were satisfied with their EDs mainly because they allow for easier searching and are more portable than PDs.

**Descriptive analysis for LPS use.** This section and the following two sections report the results of Item 3 on Section 5, which required students to rate the frequency of use according to a five-point scale. The results presented in these sections came from the 226 students who completed the questionnaire, the Vocabulary Levels Test and the TOEFL, because the analysis included the comparison between two vocabulary-size groups and reading-ability groups. This section summarizes the results of descriptive analysis (i.e., means, standard deviations), and the next section reports the results of
correlational analysis, followed by a section that summarizes the results of two-way ANOVAs.

Table 4.1 summarizes the means and standard deviations in the frequency of use for three types of dictionaries (i.e., an English-Japanese dictionary, a Japanese-English dictionary, and a monolingual English dictionary) for the 226 students. On the whole, students used an English-Japanese dictionary quite often ($M = 4.45, SD = .896$). Among the three types of dictionaries, students used an English-Japanese dictionary most frequently, a Japanese-English dictionary less frequently ($M = 3.63, SD = .1201$), and an English monolingual dictionary least frequently ($M = 1.59, SD = .935$).

<table>
<thead>
<tr>
<th>Dictionary type</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-J</td>
<td>225</td>
<td>4.45</td>
<td>.896</td>
</tr>
<tr>
<td>J-E</td>
<td>226</td>
<td>3.63</td>
<td>1.201</td>
</tr>
<tr>
<td>E-E</td>
<td>223</td>
<td>1.59</td>
<td>.935</td>
</tr>
</tbody>
</table>


Table 4.1: Mean Scores and Standard Deviations in Frequency of Use for Three Types of Dictionaries

Table 4.2 presents the means and standard deviations in the frequency of dictionary use for four skills for the 226 students. On average, students used a dictionary quite frequently for reading ($M = 4.15, SD = 1.160$). Among the four skills, the students used a dictionary most frequently for reading and the second most frequently for writing.
($M = 3.96, SD = 1.175$). They did not often consult a dictionary for listening and speaking ($M = 2.13, SD = 1.063; M = 2.29, SD = 1.220$, respectively).

<table>
<thead>
<tr>
<th>Skill</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>226</td>
<td>4.15</td>
<td>1.160</td>
</tr>
<tr>
<td>Writing</td>
<td>226</td>
<td>3.96</td>
<td>1.175</td>
</tr>
<tr>
<td>Listening</td>
<td>225</td>
<td>2.13</td>
<td>1.063</td>
</tr>
<tr>
<td>Speaking</td>
<td>226</td>
<td>2.29</td>
<td>1.220</td>
</tr>
</tbody>
</table>

Table 4.2: Mean Scores and Standard Deviations in Frequency of Dictionary Use for Four Skills

Table 4.3 shows the means and standard deviations in the frequency of dictionary use for 226 students for 13 LPS categories. Among the 13 categories, the students most frequently used categories such as *lookup strategies* ($M = 3.70, SD = .850$), *basic dictionary use* ($M = 3.56, SD = .785$), and *combined use of LPSs* ($M = 3.54, SD = .893$).

The second most frequently used categories were those such as *guessing strategies using immediate context* ($M = 3.19, SD = .837$), *selective use of LPSs* ($M = 3.18, SD = .614$), *guessing strategies using wider context* ($M = 3.15, SD = .809$), and *extended dictionary use for meaning* ($M = 3.03, SD = .914$). They less frequently used categories included those such as *extended dictionary use for grammatical information* ($M = 2.85, SD = .980$), *self-initiation* ($M = 2.83, SD = 1.112$), *extended dictionary use for usage* ($M = 2.75, SD = .718$), *note-taking strategies* ($M = 2.70, SD = .738$), and *dictionary use for vocabulary learning* ($M = 2.69, SD = .803$). Finally, they least frequently used *social strategies* ($M =
2.45, $SD = .982$), indicating that the students infrequently used the strategies of asking others. This indicates that the students frequently used both dictionary and guessing strategies, either separately or in combination, although they infrequently asked others.
Table 4.3: Mean Scores and Standard Deviations in Frequency of Dictionary Use for 13 LPS Categories

<table>
<thead>
<tr>
<th>LPS category</th>
<th>N</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP</td>
<td>226</td>
<td>3.70</td>
<td>.850</td>
</tr>
<tr>
<td>BDU</td>
<td>226</td>
<td>3.56</td>
<td>.785</td>
</tr>
<tr>
<td>CULPS</td>
<td>225</td>
<td>3.54</td>
<td>.893</td>
</tr>
<tr>
<td>GSUI</td>
<td>225</td>
<td>3.19</td>
<td>.837</td>
</tr>
<tr>
<td>SULPS</td>
<td>225</td>
<td>3.18</td>
<td>.614</td>
</tr>
<tr>
<td>GSUW</td>
<td>225</td>
<td>3.15</td>
<td>.809</td>
</tr>
<tr>
<td>EDUM</td>
<td>226</td>
<td>3.03</td>
<td>.914</td>
</tr>
<tr>
<td>EDUGI</td>
<td>226</td>
<td>2.85</td>
<td>.980</td>
</tr>
<tr>
<td>SI</td>
<td>226</td>
<td>2.83</td>
<td>1.112</td>
</tr>
<tr>
<td>EDUU</td>
<td>226</td>
<td>2.75</td>
<td>.718</td>
</tr>
<tr>
<td>NTS</td>
<td>225</td>
<td>2.70</td>
<td>.738</td>
</tr>
<tr>
<td>EDUVL</td>
<td>226</td>
<td>2.69</td>
<td>.803</td>
</tr>
<tr>
<td>SS</td>
<td>226</td>
<td>2.45</td>
<td>.982</td>
</tr>
</tbody>
</table>

Note. LS = lookup strategies; BDU = basic dictionary use; CULPS = combined use of LPSs; GSUI = guessing strategies using immediate context; SULPS = selective use of LPSs; GSUW = guessing strategies using wider context; EDUM = extended dictionary use for meaning; EDUGI = extended dictionary use for grammatical information; SI = self-initiation; EDUU = extended dictionary use for usage; NTS = note-taking strategies, DUVL = dictionary use for vocabulary learning; SS = social strategies.

Correlational analysis for LPS use. The correlations of Vocabulary Levels Test scores, TOEFL scores, and dictionary type (ED and PD) with frequency of dictionary use for three types of dictionaries were calculated. The results are presented in Table 4.4. In the following interpretation of the results, Davis’s (1971) adjectives and adverbs for describing the magnitudes of relationships are used because of their greater distinctions. A moderate association was found between dictionary type and the frequency of use for a Japanese-English dictionary ($r_{pb} = .346$). Moreover, low associations were found between dictionary type and the frequency of use for a monolingual dictionary ($r_{pb} = .174$), and between dictionary type and the frequency of use for an English-Japanese dictionary ($r_{pb} = .250$).
These positive associations indicate that ED users consulted the three types of dictionaries, especially a Japanese-English dictionary, more often than PD users.

Low associations were found between the Vocabulary Levels Test scores and the frequency of use for a monolingual dictionary (\(r = .237\)), and between the Vocabulary Levels Test scores and the frequency of use for an English-Japanese dictionary (\(r = .215\)). Similarly, a moderate association was found between the TOEFL scores and the frequency of use for a monolingual dictionary (\(r = .300\)). Also, low associations were found between the TOEFL scores and the frequency of use for an English-Japanese dictionary (\(r = .222\)), and between the TOEFL scores and the frequency of use for a Japanese-English dictionary (\(r = .115\)), although the association with a Japanese-English dictionary was not statistically significant. These associations indicate that high-proficiency students in terms of both vocabulary and reading ability more frequently consulted a dictionary, particularly a monolingual dictionary and an English-Japanese dictionary.

<table>
<thead>
<tr>
<th>Dictionary type</th>
<th>Vocabulary Levels Test ((r))</th>
<th>TOEFL ((r))</th>
<th>Dictionary type ((r_{pb}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-J</td>
<td>.215**</td>
<td>.222**</td>
<td>.132*</td>
</tr>
<tr>
<td>J-E</td>
<td>.050</td>
<td>.115</td>
<td>.346**</td>
</tr>
<tr>
<td>E-E</td>
<td>.237**</td>
<td>.300**</td>
<td>.174**</td>
</tr>
</tbody>
</table>

*\(p < .01\), **\(p < .05\).


Table 4.4: Correlations of Vocabulary Levels Test Scores, TOEFL Scores, and Dictionary Type, with Frequency of Use for Three Types of Dictionaries
Furthermore, the correlations of Vocabulary Levels Test scores, TOEFL scores, and dictionary type (ED and PD) with the frequency of dictionary use for four skills were calculated. Table 4.5 presents the results of the correlational analyses. Dictionary type correlated only negligibly with the frequency of dictionary use for all the four skills, indicating that dictionary type was not important to explain dictionary use for the four skills. In contrast, there were low relationships between Vocabulary Levels Test scores and the frequency of dictionary use for reading ($r = .254$), and between TOEFL scores and the frequency of dictionary use for reading ($r = .285$). Also, there was a low association between TOEFL scores and the frequency of dictionary use for writing ($r = .173$). These associations indicate that high-proficiency students in terms of both vocabulary and reading used a dictionary more often than low-proficiency students for written activities. However, both Vocabulary Levels Test scores and TOEFL scores correlated only negligibly with the frequency of dictionary use for speaking and listening. This may be because neither high- nor low-proficiency students consulted a dictionary as often for oral activities as for written activities.

<table>
<thead>
<tr>
<th>Skill</th>
<th>Vocabulary Levels Test ($r$)</th>
<th>TOEFL ($r$)</th>
<th>Dictionary type ($r_{pb}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>.254**</td>
<td>.285**</td>
<td>.037</td>
</tr>
<tr>
<td>Writing</td>
<td>.043</td>
<td>.173**</td>
<td>.007</td>
</tr>
<tr>
<td>Listening</td>
<td>-.083</td>
<td>.013</td>
<td>.002</td>
</tr>
<tr>
<td>Speaking</td>
<td>.001</td>
<td>.078</td>
<td>.088</td>
</tr>
</tbody>
</table>

*p < .01, **p < .05.

Table 4.5: Correlations of Vocabulary Levels Test Scores, TOEFL Scores, and Dictionary Type, with Frequency of Dictionary Use for Four Skills
Additionally, the correlations of Vocabulary Levels Test scores, TOEFL scores, and dictionary type (ED and PD) with the frequency of use for 13 LPS categories were calculated. The results of the correlational analyses appear in Table 4.6. Dictionary type correlated only negligibly with all 13 categories, except for social strategies. A negative low relationship, albeit not statistically significant, was found between dictionary type and the frequency of use for social strategies ($r_{pb} = -.117$), indicating that ED users asked others less often than PD users.

In contrast, either moderate or low associations were found between Vocabulary Levels Test scores and the frequency of use for all 13 LPS categories, except for dictionary use for vocabulary learning. Moderate positive associations were found between Vocabulary Levels Test scores and the frequency of use for lookup strategies ($r = .437$), guessing strategies using wider context ($r = .373$), extended dictionary use for usage ($r = .334$), extended dictionary use for meaning ($r = .320$), and extended dictionary use for grammatical information ($r = .311$), whereas a moderate negative association was found between Vocabulary Levels Test scores and the frequency of use for social strategies ($r = -.325$). Low relationships were found between Vocabulary Levels Test scores and the frequency of use for guessing strategies using immediate context ($r = .291$), basic dictionary use ($r = .234$), selective use of LPSs ($r = .214$), note-taking strategies ($r = .204$), self-initiation ($r = .114$), and combined use of LPSs ($r = .108$), although the associations with the last two categories were not statistically significant.

Likewise, either moderate or low associations were found between TOEFL scores and the frequency of use for all 13 LPS categories. Moderate associations were found between TOEFL scores and the frequency of use for extended dictionary use for
grammatical information \((r = .350)\), guessing strategies using wider context \((r = .345)\), lookup strategies \((r = .341)\), and extended dictionary use for meaning \((r = .308)\). Low associations were found between TOEFL scores and the frequency of use for extended dictionary use for usage \((r = .297)\), guessing strategies using immediate context \((r = .261)\), selective use of LPSs \((r = .231)\), basic dictionary use \((r = .219)\), self-initiation \((r = .187)\), note-taking strategies \((r = .154)\), combined use of LPSs \((r = .117)\), and dictionary use of vocabulary learning \((r = .107)\), although the associations with the last two categories were not statistically significant. A negative low association was found between TOEFL scores and the frequency of use for social strategies \((r = -.239)\).

The positive relationships of scores on the Vocabulary Levels Test and the TOEFL with the frequency of use for most LPS categories indicated that high-proficiency students employed these LPSs more frequently than low-proficiency students. On the other hand, the negative relationships of these test scores with the frequency of use for social strategies indicated that low-proficiency students asked others more frequently than high-proficiency students.
Table 4.6: Correlations of Vocabulary Levels Test Scores, TOEFL Scores, and Dictionary Type, with Frequency of Use for 13 LPS Categories

<table>
<thead>
<tr>
<th>LPS category</th>
<th>Vocabulary Levels Test (r)</th>
<th>TOEFL (r)</th>
<th>Dictionary type (rpb)</th>
</tr>
</thead>
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<tr>
<td>BDU</td>
<td>.234**</td>
<td>.219**</td>
<td>.063</td>
</tr>
<tr>
<td>EDUM</td>
<td>.320**</td>
<td>.308**</td>
<td>.006</td>
</tr>
<tr>
<td>EDUU</td>
<td>.334**</td>
<td>.297**</td>
<td>.041</td>
</tr>
<tr>
<td>EDUGI</td>
<td>.311**</td>
<td>.350**</td>
<td>-.029</td>
</tr>
<tr>
<td>DUVL</td>
<td>.082</td>
<td>.107</td>
<td>-.005</td>
</tr>
<tr>
<td>LS</td>
<td>.437**</td>
<td>.341**</td>
<td>-.005</td>
</tr>
<tr>
<td>SI</td>
<td>.114</td>
<td>.187**</td>
<td>-.019</td>
</tr>
<tr>
<td>NTS</td>
<td>.204**</td>
<td>.154*</td>
<td>.051</td>
</tr>
<tr>
<td>GSUI</td>
<td>.291**</td>
<td>.261**</td>
<td>-.034</td>
</tr>
<tr>
<td>GSUW</td>
<td>.373**</td>
<td>.345**</td>
<td>-.048</td>
</tr>
<tr>
<td>CULPS</td>
<td>.108</td>
<td>.117</td>
<td>-.010</td>
</tr>
<tr>
<td>SULPS</td>
<td>.214**</td>
<td>.231**</td>
<td>.071</td>
</tr>
<tr>
<td>SS</td>
<td>-.325**</td>
<td>-.230**</td>
<td>-.117</td>
</tr>
</tbody>
</table>

*p < .01, **p < .05.

Note. BDU = basic dictionary use; EDUM = extended dictionary use for meaning; EDUU = extended dictionary use for usage; EDUGI = extended dictionary use for grammatical information; DUVL = dictionary use for vocabulary learning; LS = lookup strategies; SI = self-initiation; NTS = note-taking strategies; GSUI = guessing strategies using immediate context; GSUW = guessing strategies using wider context; CULPS = combined use of LPSs; SULPS = selective use of LPSs; SS = social strategies

**ANOVAs for LPS use.** A set of two-way ANOVAs was performed with dictionary type and vocabulary-size group as independent variables and a mean score in the frequency of use for each LPS category and item as a dependent variable. Then, another set of two-way ANOVAs was performed with dictionary type and reading-ability group as independent variables, and a mean score for each LPS category and item as a dependent variable. Overall, the results of these two-way ANOVAs corresponded with those of the correlational analyses discussed in the previous section.

First, two-way ANOVAs were performed with dictionary type (ED and PD) and
vocabulary-size group (large and small) as independent variables, and mean scores for three types of dictionaries (English-Japanese, Japanese-English, and monolingual) as dependent variables. The results appear in Tables 4.7 and 4.8. The ANOVAs revealed significant main effects for dictionary type (ED and PD) for all the three types of dictionaries, $F(1, 221) = 5.159, p = .024$, $F(1, 222) = 30.793, p = .000$, and $F(1, 219) = 7.597, p = .006$, respectively, significant main effects for vocabulary-size group for an English-Japanese dictionary, $F(1, 221) = 18.129, p = .000$, and a monolingual dictionary, $F(1, 219) = 8.450, p = .004$, and a significant interaction between dictionary type and vocabulary-size group for an English-Japanese dictionary, $F(1, 221) = 5.538, p = .019$.

The ED group consulted a Japanese-English dictionary and a monolingual dictionary more often than the PD group (3.93 and 3.05, 1.71 and 1.36, respectively); however, as shown in Figure 1, only in the small-vocabulary group did ED users consult an English-Japanese dictionary more often than PD users (4.42 and 3.86). The large-vocabulary group used an English-Japanese dictionary and a monolingual dictionary more often than the small-vocabulary group (4.65 and 4.24, 1.76 and 1.41, respectively).

There was a concern that the significant interaction between dictionary type and vocabulary-size group may have resulted from the pre-existing difference in proficiency between the two dictionary groups within each vocabulary-size group. However, the results of separate one-way ANOVAs, within each vocabulary-size group, using Vocabulary Levels Test and/or TOEFL scores as covariates, corroborate those of the two-way ANOVA; that is, a significant difference was found between the two dictionary groups within the small vocabulary group, $F(1, 107) = 9.522, p = .003$, but not within the large vocabulary group, $F(1, 111) = .052, p = .821$. 116
<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>SS</th>
<th>MS</th>
<th>F</th>
<th>p</th>
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<tbody>
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<td>E-J</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>DT</td>
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<td>3.791</td>
<td>5.159</td>
<td>.024</td>
</tr>
<tr>
<td>VS</td>
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<td>13.322</td>
<td>13.322</td>
<td>18.129</td>
<td>.000</td>
</tr>
<tr>
<td>DT*VS</td>
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<td>4.069</td>
<td>5.538</td>
<td>.019</td>
</tr>
<tr>
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<td>162.403</td>
<td>.735</td>
<td></td>
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<tr>
<td>Total</td>
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<td>.735</td>
<td></td>
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<tr>
<td>J-E</td>
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<td></td>
<td></td>
<td></td>
</tr>
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<td>39.451</td>
<td>30.793</td>
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<td>1.524</td>
<td>1.190</td>
<td>.277</td>
</tr>
<tr>
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<td>.328</td>
<td>.328</td>
<td>.256</td>
<td>.613</td>
</tr>
<tr>
<td>Within</td>
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<td>1.281</td>
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<tr>
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<td>1.281</td>
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<tr>
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<td>6.276</td>
<td>7.597</td>
<td>.006</td>
</tr>
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<td>VS</td>
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<td>6.981</td>
<td>8.450</td>
<td>.004</td>
</tr>
<tr>
<td>DT*VS</td>
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<td>.123</td>
<td>.123</td>
<td>.149</td>
<td>.700</td>
</tr>
<tr>
<td>Within</td>
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<td>180.927</td>
<td>.826</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>756.000</td>
<td>.826</td>
<td></td>
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</tr>
</tbody>
</table>


Table 4.7: Results of Two-Way ANOVAs with Dictionary Type and Vocabulary-Size Group as Independent Variables for Frequency of Use for Three Types of Dictionaries
<table>
<thead>
<tr>
<th>E-J</th>
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<th>PD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>4.65 (SD = .835)</td>
<td>4.66 (SD = .693)</td>
<td>4.65 (SD = .784)</td>
</tr>
<tr>
<td>n = 74</td>
<td>n = .41</td>
<td>n = 115</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>4.42 (.641)</td>
<td>3.86 (1.334)</td>
<td>4.24 (SD = .957)</td>
</tr>
<tr>
<td>n = 74</td>
<td>n = .36</td>
<td>n = 110</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4.53 (.751)</td>
<td>4.29 (1.110)</td>
<td>4.45 (SD = .896)</td>
</tr>
<tr>
<td>n = 148</td>
<td>n = 77</td>
<td>N = 225</td>
<td></td>
</tr>
</tbody>
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<tr>
<th>J-E</th>
<th>ED</th>
<th>PD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>3.97 (.906)</td>
<td>3.17 (1.321)</td>
<td>3.69 (1.135)</td>
</tr>
<tr>
<td>n = 74</td>
<td>n = 41</td>
<td>n = 115</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>3.88 (1.013)</td>
<td>2.92 (1.500)</td>
<td>3.57 (1.269)</td>
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<td>n = 111</td>
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<td>Total</td>
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<td>3.05 (1.404)</td>
<td>3.63 (1.201)</td>
</tr>
<tr>
<td>n = 149</td>
<td>n = 77</td>
<td>N = 226</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
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<th>E-E</th>
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<th>PD</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>1.86 (.956)</td>
<td>1.56 (1.026)</td>
<td>1.76 (.988)</td>
</tr>
<tr>
<td>n = 74</td>
<td>n = 41</td>
<td>n = 115</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>1.54 (.948)</td>
<td>1.14 (.487)</td>
<td>1.41 (.843)</td>
</tr>
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<td>n = 72</td>
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<tr>
<td>Total</td>
<td>1.71 (.963)</td>
<td>1.36 (.842)</td>
<td>1.59 (.935)</td>
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<tr>
<td>n = 146</td>
<td>n = 77</td>
<td>N = 223</td>
<td></td>
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</table>


Table 4.8: Mean Scores and Standard Deviations of Dictionary Type by Vocabulary-Size Group for Frequency of Use for Three Types of Dictionaries
Figure 1: Interaction Between Dictionary Type and Vocabulary-Size Group for an English-Japanese Dictionary
Similarly, two-way ANOVAs were performed with dictionary type (ED and PD) and reading-ability group (high and low) as independent variables, and mean scores for three types of dictionaries (English-Japanese, Japanese-English, and monolingual) as dependent variables. The results are summarized in Tables 4.9 and 4.10. The ANOVAs yielded significant main effects for dictionary type (ED and PD) for a Japanese-English dictionary, $F(1, 222) = 30.141, p = .000$, and a monolingual dictionary, $F(1, 219) = 6.126, p = .014$, significant main effects for reading-ability group for an English-Japanese dictionary, $F(1, 221) = 9.419, p = .002$, and a monolingual dictionary, $F(1, 219) = 7.658, p = .006$. The ED group consulted a Japanese-English dictionary and a monolingual dictionary more often than PD group (3.93 and 3.05, 1.71 and 1.36, respectively). The high-reading-ability group used an English-Japanese dictionary and a monolingual dictionary more often than the low-reading-ability group (4.65 and 4.25, 1.75 and 1.41, respectively).
<table>
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<th>F</th>
<th>p</th>
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<td>Within</td>
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<td>279.259</td>
<td>1.258</td>
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<td></td>
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<tr>
<td>Total</td>
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<td>3300.000</td>
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<td>E-E</td>
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<tr>
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<td>5.085</td>
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<td>.014</td>
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<td>.006</td>
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Table 4.9: Results of Two-Way ANOVAs with Dictionary Type and Reading-Ability Group as Independent Variables for Frequency of Use for Three Types of Dictionaries
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Table 4.10: Mean Scores and Standard Deviations of Dictionary Type by Reading-Ability Group for Frequency of Use for Three Types of Dictionaries
In order to examine further students’ dictionary use by skill, two-way ANOVAs were performed with dictionary type (ED and PD) and vocabulary-size group (large and small) as independent variables and mean scores for four skills as dependent variables. Tables 4.11 and 4.12 summarize the results of the ANOVAs. There was a significant main effect for vocabulary-size group, and a significant interaction between dictionary type and vocabulary-size group for reading, $F(1, 222) = 22.305, p = .000$, $F(1, 222) = 5.692, p = .018$, respectively. As shown in Figure 2, the interaction indicated that the ED group consulted a dictionary more often than the PD group in the small-vocabulary group (4.00 and 3.50), but the PD group consulted a dictionary slightly more often than the ED group in the large-vocabulary group (4.61 and 4.36). Although the difference between the two vocabulary-size groups was much smaller in the ED group, the large-vocabulary group used a dictionary more often than the small-vocabulary group for reading in both ED and PD groups (4.36 and 4.00, 4.61 and 3.50, respectively).

The results of separate one-way ANOVAs, within each vocabulary-size group, using Vocabulary Levels Test and/or TOEFL scores as covariates, roughly correspond with those of the two-way ANOVA, suggesting that the significant interaction between dictionary type and vocabulary-size group found in the two-way ANOVA was not due to the pre-existing differences between groups. The difference between the two dictionary groups was close to the significant level in the small-vocabulary group, $F(1, 108) = 3.677, p = .058$, but not in the large-vocabulary group, $F(1, 111) = .3.164, p = .078$. 

123
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Table 4.11: Results of Two-Way ANOVAs with Dictionary Type and Vocabulary-Size Group as Independent Variables for Frequency of Dictionary Use for Four Skills
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Table 4.12: Mean Scores and Standard Deviations of Dictionary Type by Vocabulary-Size Group for Frequency of Dictionary Use for Four Skills
Figure 2: Interaction Between Dictionary Type and Vocabulary-Size Group for Reading
Similarly, two-way ANOVAs were performed with dictionary type (ED and PD) and reading-ability group (high and low) as independent variables and mean scores for four skills as dependent variables. The results are presented in Tables 4.13 and 4.14. The ANOVAs revealed significant main effects for reading-ability group for reading and writing, $F(1, 222) = 21.128, p = .000$, $F(1, 222) = 6.164, p = .014$, respectively. The high-reading-ability group used a dictionary for these activities more often than the low-reading-ability group (4.50 and 3.79, 4.18 and 3.73, respectively).
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**Table 4.13: Results of Two-Way ANOVAs with Dictionary Type and Reading-Ability Group as Independent Variables for Frequency of Dictionary Use for Four Skills**
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Table 4.14: Mean Scores and Standard Deviations of Dictionary Type by Reading-Ability Group for Frequency of Dictionary Use for Four Skills
Additionally, two-way ANOVAs were performed with dictionary type (ED and PD) and vocabulary-size group (large and small) as independent variables and mean scores for 13 LPS categories as dependent variables. The results appear in Tables 4.15 and 4.16. The ANOVAs indicated no significant main effects for dictionary type (ED and PD) for all 13 categories, although the mean difference almost attained the significant level for social strategies ($p = .053$). On the other hand, significant main effects were found for vocabulary-size group for all 13 categories except for dictionary use for vocabulary learning and self-initiation (i.e., basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, combined use of LPSs, selective use of LPSs, and social strategies). The ED group used social strategies less often than the PD group, although the difference did not achieve the significant level. Among the 11 categories on which vocabulary-size group had significant effects, the small-vocabulary group used social strategies more often than the large-vocabulary group. In contrast, the large-vocabulary group used the remaining 10 categories (i.e., basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, combined use of LPSs, and selective use of LPSs) more often than the small-vocabulary group.

The results of separate one-way ANOVAs, within each vocabulary-size group, using Vocabulary Levels Test and/or TOEFL scores as covariates, generally agree with
those of the two-way ANOVAs; namely, no differences were found between the two
dictionary groups. However, there was one exception. Although the interaction between
dictionary type and vocabulary-size group did not attain the significant level in the two-
way ANOVA for *guessing strategies using immediate context* \((p = .081)\), the one-way
ANOVA revealed that the difference between the two dictionary groups almost attained
the significance within the large-vocabulary group \((p = .05)\) for this category, indicating
that the ED group appeared to use *guessing strategies using immediate context* less
frequently than the PD group.
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Note. BDU = basic dictionary use; EDUM = extended dictionary use for meaning; EDUU = extended dictionary use for usage; EDUGI = extended dictionary use for grammatical information; DUVL = dictionary use for vocabulary learning; LS = lookup strategies; SI = self-initiation; NTS = note-taking strategies; GSUI = guessing strategies using immediate context; GSUW = guessing strategies using wider context; CULPS = combined use of LPSs; SULPS = selective use of LPSs; SS = social strategies

Table 4.15: Results of Two-Way ANOVAs with Dictionary type and Vocabulary-Size Group as Independent Variables for 13 LPS Categories
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### Table 4.16: Mean Scores and Standard Deviations of Dictionary Type by Vocabulary-Size Group for 13 LPS Categories

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**Note.** BDU = basic dictionary use; EDUM = extended dictionary use for meaning; EDUU = extended dictionary use for usage; EDUGI = extended dictionary use for grammatical information; DUVL = dictionary use for vocabulary learning; LS = lookup strategies; SI = self-initiation; NTS = note-taking strategies; GSUI = guessing strategies using immediate context; GSUW = guessing strategies using wider context; CULPS = combined use of LPSs; SULPS = selective use of LPSs; SS = social strategies
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Likewise, two-way ANOVAs were carried out with dictionary type (ED and PD) and reading-ability group (high and low) as independent variables and mean scores for 13 LPS categories as dependent variables. The ANOVAs yielded no significant main effects for dictionary type (ED and PD) for all 13 categories. The results appear in Tables 4.17 and 4.18. On the other hand, significant main effects were found for reading-ability group for all 13 categories except for *dictionary use for vocabulary learning* and *combined use of LPSs* (i.e., *basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, self-initiation, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, selective use of LPSs, and social strategies*). Among the 11 categories on which reading ability had significant effects, the low-reading-ability group used *social strategies* more often than the high-reading-ability group. In contrast, the high-reading-ability group used the remaining 10 categories more often than the low-reading-ability group (i.e., *basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, self-initiation, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, and selective use of LPSs*).
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*Note.* BDU = basic dictionary use; EDUM = extended dictionary use for meaning; EDUU = extended dictionary use for usage; EDUGI = extended dictionary use for grammatical information; DUVL = dictionary use for vocabulary learning; LS = lookup strategies; SI = self-initiation; NTS = note-taking strategies; GSUI = guessing strategies using immediate context; GSUW = guessing strategies using wider context; CULPS = combined use of LPSs; SULPS = selective use of LPSs; SS = social strategies

Table 4.17: Results of Two-Way ANOVAs with Dictionary Type and Reading-Ability Group as Independent Variables for 13 LPS Categories
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*Note.* BDU = basic dictionary use; EDUM = extended dictionary use for meaning; EDUU = extended dictionary use for usage; EDUGI = extended dictionary use for grammatical information; DUVL = dictionary use for vocabulary learning; LS = lookup strategies; SI = self-initiation; NTS = note-taking strategies; GSUI = guessing strategies using immediate context; GSUW = guessing strategies using wider context; CULPS = combined use of LPSs; SULPS = selective use of LPSs; SS = social strategies

Table 4.18: Mean Scores and Standard Deviations of Dictionary Type by Reading-Ability Group for 13 LPS Categories
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| GSUW    |          |          |            |
| High    | 3.36 (SD = .738) | 3.43 (SD = .853) | 3.38 (SD = .773) |
|         | n = 78   | n = 36   | n = 114    |
| Low     | 2.86 (SD = .748) | 3.00 (SD = .827) | 2.91 (SD = .777) |
|         | n = 71   | n = 40   | n = 111    |
| Total   | 3.12 (SD = .783) | 3.20 (SD = .861) | 3.15 (SD = .809) |
|         | n = 149  | n = 76   | N = 225    |

| CULPS   |          |          |            |
| High    | 3.60 (SD = .845) | 3.65 (SD = .992) | 3.61 (SD = .890) |
|         | n = 78   | n = 36   | n = 114    |
| Low     | 3.46 (SD = .829) | 3.46 (SD = 1.009) | 3.46 (SD = .894) |
|         | n = 71   | n = 40   | n = 111    |
| Total   | 3.53 (SD = .838) | 3.55 (SD = .999) | 3.54 (SD = .893) |
|         | n = 149  | n = 76   | N = 225    |

| SULPS   |          |          |            |
| High    | 3.32 (SD = .549) | 3.24 (SD = .615) | 3.29 (SD = .569) |
|         | n = 78   | n = 36   | n = 114    |
| Low     | 3.11 (SD = .575) | 3.02 (SD = .747) | 3.07 (SD = .640) |
|         | n = 71   | n = 40   | n = 111    |
| Total   | 3.22 (SD = .569) | 3.12 (SD = .692) | 3.18 (SD = .614) |
|         | n = 149  | n = 76   | N = 225    |

| SS      |          |          |            |
| High    | 2.28 (SD = .844) | 2.40 (SD = .924) | 2.32 (SD = .868) |
|         | n = 78   | n = 36   | n = 114    |
| Low     | 2.47 (SD = .1048) | 2.79 (SD = 1.095) | 2.59 (SD = 1.072) |
|         | n = 71   | n = 41   | n = 112    |
| Total   | 2.37 (SD = .949) | 2.61 (SD = 1.031) | 2.45 (SD = .982) |
|         | n = 149  | n = 77   | N = 226    |
The results of ANOVAs showed that both the ED and PD groups depended on dictionaries, as indicated by the high mean scores in the frequency of use for an English-Japanese dictionary (mean = 4.45) and for reading (mean = 4.15). However, the results showed that the ED group consulted dictionaries more often than the PD group. The significant interactions between dictionary type and vocabulary-size group for an English-Japanese dictionary and for reading indicated that EDs increased the frequency of dictionary use, especially of the small-vocabulary group. The ED group also consulted a wider range of dictionaries, including Japanese-English and monolingual dictionaries. EDs appeared to enhance the use of different types of dictionaries because they contain multiple dictionaries in one device and allow their users to jump from one dictionary to another. Given the finding that ED users tended to use an ED rather exclusively, this suggests not so much that ED users had more options for looking up a word (i.e., having both an ED and a PD) but rather that EDs did facilitate dictionary consultation due to their ease of searching.

However, the ED and PD groups did not differ significantly in the use of any of 13 LPS categories, suggesting that the two groups did not differ in terms of their LPS use except for the shear frequency of dictionary consultation. In contrast, the large- and small-vocabulary groups differed in the use of the 11 LPS categories, and large-vocabulary students used 10 of the 11 categories more often than small-vocabulary students. Furthermore, high-reading-ability students used a similar set of 10 categories more frequently than low-reading-ability students. This suggests that language proficiency rather than dictionary type matter for LPS use. Regardless of whether they
use an ED or a PD, successful students frequently use a variety of LPSs involving
dictionary use and guessing.

However, one concern remains about the impact of EDs. Although the two-way
ANOVAAs did not reveal the significant differences between the ED and PD groups for
any of the 13 LPS categories, for some of the categories involving dictionary use, such as
*basic dictionary use* and *extended dictionary use for usage*, the ED group had higher
means than the PD group. In contrast, for the categories involving guessing, such as
*guessing strategies using immediate context* and *guessing strategies using wider context*,
the PD group had higher means than the ED group. Furthermore, the one-way ANOVA
did indicate that in the large-vocabulary group, the ED group tended to use *guessing
strategies using immediate context* less frequently than the PD group. These results may
show a possibility that some ED users consulted a dictionary at the expense of contextual
guessing.

Many of the 13 LPS categories were used more often by the high-proficiency
groups in both vocabulary and reading ability than the low-proficiency groups. However,
the category of *social strategies* was an exception. These strategies were used more often
by low-proficiency groups in both vocabulary and reading ability than high-proficiency
groups, suggesting that they may not be helpful for both vocabulary learning and reading.
The finding that the ED group tended to use these strategies less often than the PD group
may point to the positive effects of EDs.

**Discussion**

This study explored the use of EDs, PDs, and other LPSs by Japanese university
students. This section discusses the main findings of the first stage of the study in relation
to other studies, including overall patterns of the students’ ED use (i.e., the percentage of ownership, the frequency of use, perceived advantages and disadvantages), the impact of EDs on their LPS use, overall patterns of their LPS use, and the relationship between English proficiency and LPS use.

First, this study found that 72% of the Japanese university students owned an ED. This percentage of ownership is comparable with those found in recent studies. For example, Ronald (2004) found in another study with Japanese university students that 70% of the students owned an ED. Likewise, Tang (1997) found in her study with Chinese ESL students that 87% of the students owned an ED. Along with these other studies, this study points to the trend that EDs have become popular among Asian learners of English.

This study also found that those who owned an ED tended to use it almost exclusively, even if they also owned a PD. Seventy-five percent of ED owners reported that they primarily used an ED, and an additional 16% used an ED more often than a PD, whereas 8% used an ED and a PD with the same frequency, and 1% used a PD more often. This finding is different from that of Taylor and Chan (1994). They found that only 28% of students reported they used a PD more often than an ED, whereas 46% used a PD more often, and 26% the two types of dictionary with the same frequency. The students of this study appeared to depend more on an ED than those of Taylor and Chan’s study. This might be explained by recent improvements in the quality of EDs, as discussed later.

The perceived strengths and weaknesses of EDs found in this study are similar to those found in other studies. This study corroborates the previous studies in that it found the major advantages of EDs to be their portability (91%) and speed of searching (90%)
The quickness of searching with an ED compared with a PD can be explained by the differences in search processes between these two types of dictionaries. Students can look up a word faster in an ED than in a PD because they can access it by directly typing it. They even do not have to type whole letters; instead, they can type the first letters and choose the word from a list of words beginning with these letters. On the other hand, students have to flip through pages with a PD, following alphabetical order. Alphabetical order is not necessarily easy or automatic for many learners (Neubach & Cohen, 1988).

In addition, this study revealed other advantages, which have been identified in previous studies (e.g., Nesi, 1999), such as the ease in changing from one dictionary to another (71%), and the capability of looking up words that students were not sure how to spell (36%). However, unlike other studies (Tang, 1997; Taylor & Chan, 1994), only 3% of the ED owners pointed out the availability of sounds as an advantage. This is probably because most of the students’ EDs were not equipped with a sound function in English dictionaries, although some EDs contained a sound function in a dictionary of another foreign language.

Moreover, this study identified other perceived advantages such as the capability of recording the words looked up, the availability of an idiom search function, the availability of an example search function, the availability of adding dictionaries by inserting cards, and the availability of multiple dictionaries and practice exercises. In particular, the availability of multiple dictionaries was frequently mentioned by the students as one of the EDs’ advantages. The students’ EDs contained a wide range of dictionaries in one device, including an English-Japanese dictionary (100%), a Japanese-
English dictionary (98%), a monolingual English dictionary (43%), a thesaurus (65%), a Japanese dictionary, and dictionaries of other languages, and their users could jump from one dictionary to another with ease. The results of the ANOVA comparing the ED and PD groups indicated that the ED group did use a wider range of dictionaries than the PD group, suggesting that the students took advantage of these multiple dictionaries.

Another major advantage of EDs seems to be the availability of an idiom search function and an example search function. Although a user of an ED can search for idioms or examples within each entry as in a PD, these functions also enable him or her to search idioms or examples separately from other information. By using these functions, a user can look at a list of idioms or examples using a certain word or group of words. These additional search paths seem to make it easier to look up examples or idioms.

Along with these perceived advantages, this study also identified the perceived disadvantages of EDs, which are similar to those found by previous studies (Nesi, 1999; Tang, 1997; Taylor & Chan, 1994), although smaller percentages of students perceived them as disadvantages. These perceived disadvantages included the unavailability of diverse examples (39%), the lack of detailed grammatical information (32%), the lack of usage information (27%), the small screen, the limited number of headwords (16%), and breakability (9%). This study also identified additional disadvantages such as the difficulty of use, the unavailability of a sound function, the unavailability of illustrations, a limited number of idioms, the incapability of making annotations, and the ineffectiveness for word retention.

These perceived disadvantages are contradictory to the researcher’s examination of the students’ EDs against Hartmann’s (1992) criteria for a good learner’s dictionary.
Unlike other researchers (Tang, 1997; Taylor & Chan, 1994), the researcher did not recognize the significant problems with the quality of the students’ EDs. Many of them contained a number of headwords, detailed grammatical and usage information, collocations, and example sentences, although no illustrations were available. The students’ EDs were often equipped with the full contents of PDs. This discrepancy between the students’ perception and the researcher’s examination can be attributed to EDs’ interface design (Koyama & Takeuchi, 2003, 2004). Koyama and Takeuchi (2003) found that the students perceived that the ED contained more information than the PD, although the two types of dictionaries contained the same amount of information. They explained this contradiction by EDs’ interface design. Since EDs display only fragmentary information at one time, users have to scroll or tap to different screens for detailed information. Due to the trouble or difficulty with these operations, the students felt that the ED contained less information than the PD. The discrepancy between the students’ perception and the researcher’s examination in this study can be explained in the same way. In fact, 25% of the students pointed out the small screen as one of the disadvantages of EDs, and some students perceived the difficulty of use as one of the disadvantages.

Another major finding of this phase is that EDs appeared not to affect negatively the students’ LPS use. EDs seemed to increase the frequency of dictionary consultation by the students, especially those of low vocabulary proficiency. Also, EDs appeared to facilitate the use of a wide range of dictionaries, including an English-Japanese dictionary, a Japanese-English dictionary, and a monolingual dictionary. Furthermore, EDs appeared to increase weekly dictionary use, suggesting that EDs are particularly helpful for
increasing the number of instances where a dictionary is taken out (in contrast with increasing the number of times that the dictionary is used during each instance). However, EDs appeared not to impact the students’ LPS use, except for the sheer frequency of dictionary consultation, as indicated by the lack of significant differences between the two groups in terms of the use of 13 LPS categories.

The previous studies have revealed mixed results on the impact of EDs. Some studies did not find differences between ED and PD groups. For example, Koyama and Takeuchi (2003) found no significant differences between ED and PD groups in respect to the number of words searched and search time, although among high school students, the ED group tended to look up more words. Similarly, Koyama and Takeuchi (2004) found that ED and PD groups did not differ in terms of search time and the quantity of retrieved information. Osaki et al. (2003) found that there were no differences between the ED and PD groups in accessing appropriate word meanings.

On the contrary, some studies found that ED groups were superior to PD groups mainly in terms of reduced search time. For example, Koga (1995) found that the students needed less time for dictionary consultation and read faster in the CD-ROM-based-dictionary condition than in the PD condition. Similarly, Inami et al. (1996) found that when the students were allowed to search each word freely, search time was reduced, and they were able to consult one word multiple times in the CD-ROM-based-dictionary condition. Iso and Osaki (2004) found that the ED group was better at choosing the contextual meaning than the PD group.

However, the superiority of EDs over PDs claimed by these studies needs to be interpreted with caution. Koga (1995) and Iso and Osaki (2004) used difficult texts in
their experiments, which may not have been appropriate for their participants. This may be the reason that they found that the ED groups were superior to the PD groups. On the other hand, Inami et al. (1996) used a mechanical task, requiring the students to learn a set of English words. Considering these conditions, the superiority of EDs may not be applicable to other situations. In normal conditions, EDs may not significantly affect students’ dictionary use.

The first phase of the present study differs from these previous studies in that it examined students’ general use of EDs, rather than the use of EDs while engaging in a specific task. Also, this study looked at the use of different types of dictionaries, and the use of dictionaries in relation to other LPSs. However, in association with these previous studies, this study appears to indicate that EDs do not have a significant impact on students’ dictionary behavior, but EDs may increase the dictionary consultation of some students, such as low-proficiency students and inexperienced students, or in some conditions, such as those that require looking up a large number of unknown words. Also, this study may indicate that although EDs may not significantly influence the use of one type of dictionary use per task, when looking at dictionary use on a daily basis, EDs may not only facilitate the use of a wider range of dictionaries but also increase the number of instances where a dictionary is taken out. The effects of EDs on students’ LPS are further discussed in chapter 5, including the reasons why no clear differences have been found between the ED and PD groups in their LPS use.

Although no significant differences were found, the ED group had a tendency to employ guessing strategies less often. This finding may justify educators’ concerns
expressed in some studies that EDs discourage students to interact with the text and guess word meanings by using contextual cues (Tang, 1997; Taylor & Chan, 1994).

Additionally, this study discovered general patterns of LPS use by the Japanese university students, whether they used a PD or an ED. Overall, 17% of the students reported using a dictionary daily, 24% of the students 4 or 5 times a week, 33% of the students 2 or 3 times a week, 4% once a week, and the other 22% less often, although the ED users seemed to use a dictionary more often than the PD users (daily use 21%, weekly use additional 65%), and English majors seemed to use a dictionary more often than non-English majors (daily use 26%, weekly use additional 62%). These percentages indicate that the students did not use a dictionary as often as previous studies showed (e.g., Baxter, 1980; Béjoint, 1981). For example, Baxter (1980) examined the dictionary use of Japanese university students, including both English majors and non-English majors. He found that 17.9% of all the students used a dictionary daily, 70.4% several times per week, 8.7% once per week, and 3.0% less often. Béjoint (1981) worked with another group of EFL students, who were English majors at a French university, and found that 40% of the students used a dictionary at least once a day, and an additional 52% at least once a week. Even English majors of the present study used a dictionary less often than the students in these previous studies. This may be because the students of the present study did not depend on a dictionary for English learning as much as those in previous studies. However, a more plausible reason may be that the students of the present study, who were mostly freshmen and sophomores, did not spend much time studying English; 32% of the students reported spending less than 30 minutes per week...
studying English outside of class including course-related study, 18% less than 1 hour, and 18% less than 2 hours.

Another related finding is that the students used a dictionary more sparingly when reading texts than EFL students in some previous studies did (e.g., Gu, 2003). Many students reported that they did not look up all or almost all unknown words when they were reading texts to prepare for their English classes; 26% of the students consulted a dictionary for more than 90% of unknown words, 27% of the students for 70-90% of unknown words, 30% of the students for 50-70% of unknown words, and 17% of the students for less than 50% of unknown words. This finding also showed that the students did not depend on a dictionary for English learning as heavily as other studies found, although they still used a dictionary frequently; that is, 70% of the students looked up more than 50% of unknown words.

The students of the present study consulted an English-Japanese dictionary the most frequently, a Japanese-English dictionary the second most frequently, and a monolingual dictionary the least frequently. This finding agrees with those of previous studies on dictionary use of Japanese learners of English (Béjoint, 1981; Kobayashi, 2000, Schmitt, 1997). The previous studies, as well as the present study, found that Japanese students depend heavily on bilingual dictionaries and do not frequently use monolingual dictionaries, which is disappointing given the advantages that good learners’ monolingual dictionaries could offer (i.e., Baxter, 1980).

This study also found that the students used a dictionary the most frequently for reading, the second most frequently for writing, and the least frequently for speaking and listening. This finding is similar to those of previous studies (Béjoint, 1981, Tomaszczyk,
1979). In association with these studies, this study suggests that dictionaries are used for literacy activities more often than for oral activities.

The students often used LPS categories related to both dictionary and guessing strategies, such as lookup strategies, basic dictionary use, combined use of LPSs, guessing strategies using immediate context, selective use of LPSs, guessing strategies using wider context, and extended dictionary use for meaning, whereas they did not use social strategies often. The students frequently consulted a dictionary for basic and some additional information, whereas they also guessed word meanings, using both immediate and wider contexts. They also consulted a dictionary to confirm guessed meanings. Although the students depended on a dictionary, they also used it selectively for important words while ignoring or guessing other words. They less frequently asked others about words.

This finding partially agrees with those of previous studies using Japanese learners of English. For example, Schmitt (1997) examined the use of 41 vocabulary learning strategies by Japanese EFL students. Like those in the present study, the students in Schmitt’s study frequently employed strategies such as consulting a bilingual dictionary and guessing from context, although they also frequently asked classmates about meanings. Similarly, Kobayashi (2000) worked with Japanese ESL students and found that they frequently consulted a bilingual dictionary and guessed from context. The ESL students also frequently skipped or passed new words. Along with these previous studies, this study indicates that Japanese students depend on dictionaries, although they also use other LPSs such as guessing and ignoring.
Finally, this study found that it was language proficiency rather than dictionary type that mattered for the students’ LPS use. The ANOVAs revealed that regardless of whether they used an ED or a PD, students of high proficiency, in terms of both vocabulary and reading ability, used most of the LPS categories more often than those of low proficiency. This suggests that successful learners used both dictionaries and contextual guessing more often than less successful learners, although they used these strategies selectively according to the nature of the word. This finding is similar to those of previous studies. For example, Gu and Johnson (1996) found that contextual guessing and skillful use of dictionaries were both positively correlated with general proficiency and vocabulary size. Similarly, Fan (2003) found that the more proficient students often used both guessing and dictionary strategies.

The correlations between Vocabulary Levels Test scores and the frequency of use for 13 LPS categories, as well as the correlations between TOEFL scores and the frequency of use for 13 LPS categories, indicated that among the LPS categories more often used by high-proficiency students, categories such as *lookup strategies*, *guessing strategies using wider context*, *extended dictionary use for usage*, *extended dictionary use for meaning*, and *extended dictionary use for grammatical information* were particularly strongly associated with language proficiency. Previous studies also found positive relationships of proficiency with these LPSs. For example, Gu and Johnson (1996) found that the skillful use of dictionaries was positively correlated with general proficiency and vocabulary size, indicating a relationship of proficiency with *lookup strategies*. Fan (2000) found that more proficient students in vocabulary used most of the available dictionary information more often than the less proficient students, underscoring the
importance of the categories such as extended dictionary use for usage, extended dictionary use for meaning, and extended dictionary use for grammatical information.

Studies on guessing from context (Chern, 1993; Haynes, 1993; Huckin & Jin, 1987) show that L2 learners are generally successful in the use of local cues, but not very successful in the use of global cues, suggesting that guessing strategies using wider context is a more advanced skill than guessing strategies using immediate context, which requires more experience or training.

The results of the ANOVA indicated that the category of self-initiation was more important for distinguishing high- and low-proficiency groups in reading than in vocabulary. In contrast, the strategy of combined use of LPSs was more important for distinguishing high- and low-proficiency groups in vocabulary. Since the correlations between these categories and Vocabulary Levels Test scores, and between these categories and TOEFL scores, were both low as discussed below, no strong claim can be made from this finding. However, it may indicate that reading extensively is more important for improving reading skills, rather than spending time by looking up a word that has already been dealt with by other LPSs such as contextual guessing.

Although the categories such as self-initiation and selective use of LPSs were positively correlated with Vocabulary Levels Test scores and TOEFL scores, the associations, especially those with Vocabulary Levels Test scores, were not very strong. These strategies are the metacognitive strategies involving the active management of LPSs. This finding is somewhat contradictory to those of previous studies on vocabulary learning strategies (Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999, Lawson & Hogben, 1996; Sanaoui, 1995). This inconsistency may have occurred because this study
focused on the use of LPSs rather than on a whole set of vocabulary learning strategies, and the strategies in *self-initiation* and *selective use of LPSs* only involved a small portion of vocabulary learning strategies related to the active management of vocabulary learning. Another possible reason may be that the subjects of the present study were all EFL students who had limited resources for learning English, and for these students, the active management of learning by seeking opportunities or material for practice or selectively paying attention to material may not be as important as for ESL students. Gu and Johnson (1996) also found that there were two types of successful EFL students. Although one small group excelled in vocabulary size and general proficiency through extensive reading, another group excelled by actively employing a wide range of strategies. In a qualitative study, Gu (2003) also found that two successful students had different approaches to learning English; one student succeeded in learning English through extensive reading, but the other student succeeded through intensive reading. These studies suggest that intensive engagement in limited materials may be another way of excelling in English proficiency in EFL contexts.

Although the ANOVA revealed that vocabulary size had a significant impact on *combined use of LPSs*, the associations of *combined use of LPSs* with Vocabulary Levels Test scores and TOEFL scores were both low. This also contradicts previous studies. These studies show that inferring word meanings before consulting a dictionary is an effective strategy that helps students not only retain words (Fraser, 1999a; Schouten-van Parreren, 1989) but also choose the appropriate meaning from those listed in the dictionary (Neubach & Cohen, 1988). This inconsistency may suggest that inferring word meanings before consulting a dictionary may not always be helpful.
The main findings of the first stage of the study include overall patterns of the students’ ED use (i.e., the percentage of ownership, the frequency of use, perceived advantages and disadvantages), the impact of EDs on their LPS use, overall patterns of their LPS use, and the relationship between English proficiency and LPS use. Whereas the findings generally coincide with those of previous studies, some findings uncover a new and different picture of students’ use of dictionaries and other LPSs.

**Retrospective Think-aloud Protocol Results**

This section reports the results of the quantitative as well as the qualitative analysis of retrospective think-aloud protocols elicited during the reading session. It also presents the results of the quantitative analysis of the reading test administered during the reading session, and the vocabulary tests administered one week after the reading session. First, quantitative results are reported, and then qualitative results are presented. Next, the results of the quantitative as well as the qualitative analysis are discussed, by combining them whenever possible as well as by comparing them with the results of other studies.

**Quantitative Analysis**

This section reports the results of quantitative analysis of retrospective think-aloud protocols, the reading test administered during the reading session, and the vocabulary tests administered one week after the reading session. First, this section presents the results of analysis on LPS use, such as descriptive statistics, correlational analysis, and $t$-tests. Second, the results of analysis on reading comprehension and vocabulary learning are reported, including descriptive statistics, correlational analysis, and $t$-tests.
**LPS use.** In total, the 22 students identified 578 unknown or difficult words out of the total words read by them (11,418 words), with an average of 26 words out of the total words in the text (519 words). However, there was a wide variability in the number of the unknown or difficult words that the students identified, which ranged from 11 words to 52 words. On average, the percentage of unknown or difficult words out of the total words in the text (519 words) was 5%, with a range of 2% to 10%.

Table 4.19 presents the mean scores, standard deviations, maximum/minimum scores, and ranges of the 22 students for the rates of LPS use (the rate of consulting, the rate of guessing, the rate of ignoring, and the rate of combined LPS use). It also presents these scores for the success rates of LPS use associated with consulting and/or inferring (the rate of successful consulting, the rate of successful/partially successful consulting, the rate of successful guessing, the rate of successful/partially successful guessing, the rate of successful combined LPS use, and the rate of successful/partially successful combined LPS use).

To illustrate the rates of use of the LPS options numerically, on average, the students looked up 69% of unknown or difficult words. The percentage of consulting ranged from 7% to 100%. On the other hand, they inferred 52% of unknown or difficult words. The percentages of inferring ranged from 16% to 85%. They ignored only 10% of unknown or difficult words. The percentages of ignoring ranged from 0% to 53%. They consulted after inferring 31% of the time. The percentages of consulting after inferring ranged from 0% to 67%.

As far as the success rates of determining word meanings are concerned, the students successfully consulted 80% of the time (range = 86), and successfully/partially
successfully 85% of the time (range = 57). Forty-three percent of inferring was successful (range = 85), and 79% of inferring was successful/partially successful (range = 52). The students successfully consulted after inferring 79% of the time (range = 100) and successfully/partially successfully consulted after inferring 84% of the time (range = 100).

These results indicate that on average, the students most frequently consulted, less frequently inferred, and least frequently ignored. When students consulted or inferred, they were generally successful in determining word meanings. Individual differences were found both in the rates of use of the LPS options and the success rates of determining word meanings. There was a wider range in both the rates of use of the LPS options and the success rates of determining word meanings.

<table>
<thead>
<tr>
<th>Rate</th>
<th>N</th>
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<th>SD</th>
<th>Max</th>
<th>Min</th>
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Note. CTR = rate of consulting; CSR = rate of successful consulting; CSPR = rate of successful/partially successful consulting; GTR = rate of guessing; GSR = rate of successful guessing; GSPR = rate of successful/partially successful guessing; COTR = rate of combined LPS use; COSR = rate of successful combined LPS use; COSPR = rate of successful/partially successful combined LPS use; ITR = rate of ignoring.

Table 4.19: Rates of Use of LPS Options and Success Rates of Determining Word Meanings
The correlation coefficients were calculated in order to examine associations of Vocabulary Levels Test scores, TOEFL scores, and dictionary type, with the rates of use of LPS options, and with the success rates of determining word meanings. The results are summarized in Table 4.20. Since the sample size was small, the correlations were overall higher than those for questionnaire data. In the interpretation of the results, Davis’s (1971) adjectives and adverbs for describing magnitude of statistical relationships are used.

Overall, dictionary type correlated higher with the rates of use of LPS options than with the actual success rates of determining word meanings. Moderate relationships were found between dictionary type and the rate of consulting \((r_{pb} = .336)\), and between dictionary type and the rate of guessing \((r_{pb} = -.338)\), although these associations were not statistically significant. The positive statistical relationship between dictionary type and the rate of consulting indicated that the ED group consulted more often than the PD group, whereas the negative relationship between dictionary type and the rate of guessing indicated that the PD group inferred more often than the ED group.

In contrast, Vocabulary Levels Test scores moderately or substantially correlated with some of the rates of use of LPS options and also one of the success rates of determining word meanings. Substantial relationships were found between Vocabulary Levels Test scores and the rate of guessing \((r = .513)\), and between Vocabulary Levels Test scores and the rate of successful/partially successful guessing \((r = .637)\). These positive statistical relationships indicated that the large-vocabulary students inferred more often and more successfully than the small-vocabulary students. A moderate negative
relationship, albeit not statistically significant, was found between Vocabulary Levels Test scores and the rate of consulting \((r = -0.367)\), indicating that small-vocabulary students consulted more often than large-vocabulary students.

TOEFL scores moderately or substantially correlated with some of the success rates of determining word meanings. There were substantial correlations between TOEFL scores and the rate of successful/partially successful consulting \((r = 0.518)\), and between TOEFL scores and the rate of successful/partially successful guessing \((r = 0.519)\). There was a moderate correlation between TOEFL scores and the rate of successful consulting \((r = 0.361)\), albeit not statistically significant. These positive statistical relationships indicated that high-reading-ability students consulted and inferred more successfully than low-reading ability students.
<table>
<thead>
<tr>
<th>Rate</th>
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<th>TOEFL ($r$)</th>
<th>Dictionary type ($r_{pb}$)</th>
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* $p < .01$, ** $p < .001$.

Note. CTR = rate of consulting; CSR = rate of successful consulting; CSPR = rate of successful/partially successful consulting; GTR = rate of guessing; GSR = rate of successful guessing; GSBR = rate of successful/partially successful guessing; COTR = rate of combined LPS use; COSR = rate of successful combined LPS use; COSPR = rate of successful/partially successful combined LPS use; ITR = rate of ignoring.

Table 4.20: Correlations of Vocabulary Test Scores, TOEFL Scores, and Dictionary Type, with the Rates of Use of LPS Options, and with Success Rates of Determining Word Meaning

These results roughly corresponded with those of the $t$-tests. For the $t$-tests, $\alpha$ level was set at .05. A set of $t$-tests was carried out with dictionary type as an independent variable and each of the rates of use of LPS option and success rates of determining word meanings as a dependent variable. The results of the $t$-tests are shown in Table 4.21.

No significant differences were found between the two dictionary groups for any of the rates of use of LPS options and the success rates of determining word meanings. The ED group had a higher mean score for the rate of consulting than the PD group (.7699 and .6075). In contrast, the PD group had a higher mean score for the rate of
guessing than the ED group (.5842 and .4568). In particular, the four ED users who belonged to low-scoring groups in both vocabulary and reading guessed less than 30% of unknown or difficult words (see Appendix S). However, these differences between ED and PD groups in the rate of consulting and the rate of guessing did not reach the statistically significant level.

Another set of $t$-tests was carried out with vocabulary-size group as an independent variable and each of the rates of use of LPS option and success rates of determining word meanings as a dependent variable. The results of the $t$-tests are summarized in Table 4.22.
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Note. CTR = rate of consulting; CSR = rate of successful consulting; CSPR = rate of successful/partially successful consulting; GTR = rate of guessing; GSR = rate of successful guessing; GSPr = rate of successful/partially successful guessing; COTR = rate of combined LPS use; COSR = rate of successful combined LPS use; COSPR = rate of successful/partially successful combined LPS use; ITR = rate of ignoring.

Table 4.21: Results of $t$-Tests with Dictionary Type as an Independent Variable for Rates of Use of LPS Options and Success Rates of Determining Word Meanings
Table 4.21 continued

<table>
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<tr>
<th>COSR</th>
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A significant differences was found between the large- and small-vocabulary groups for the rate of successful/partially successful guessing, $t(20) = -3.161, p = .005$; the large-vocabulary group had a higher mean score for the rate of successful/partially successful guessing. Furthermore, the large-vocabulary group had a higher mean score for the rate of guessing than the small-vocabulary group (.5777 and .4518), and the small-vocabulary group had a higher mean score for the rate of consulting than the large-vocabulary group (.7778 and .6144). These mean differences, however, were not statistically significant.
<table>
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</table>

Note. CTR = rate of consulting; CSR = rate of successful consulting; CSPR = rate of successful/partially successful consulting; GTR = rate of guessing; GSR = rate of successful guessing; GSIPR = rate of successful/partially successful guessing; COTR = rate of combined LPS use; COSR = rate of successful combined LPS use; COSIPR = rate of successful/partially successful combined LPS use; ITR = rate of ignoring.

Table 4.22: Results of t-Tests with Vocabulary-Size Group as an Independent Variable for Rates of Use of LPS Options and Success Rates of Determining Word Meanings
Another set of $t$-tests was performed with reading-ability group as an independent variable and each of the rates of use of LPS option and success rates of determining word meanings as a dependent variable. The results of the $t$-tests are summarized in Table 4.23. Significant differences were found between the high- and low-reading-ability groups for the rate of successful consulting, $t(20) = -2.801, p = .011$, the rate of successful/partially successful consulting, $t(20) = -3.488, p = .002$, the rate of successful/partially successful guessing, $t(20) = -3.980, p = .001$, and the rate of successful combined LPS use, $t(20) = -2.147, p = .044$. The significant difference found between the two reading-ability groups for the rate of successful combined LPS use, which was inconsistent with the low correlation of the variable with TOEFL scores ($r = .127$), can be explained by the floor effect. Namely, many of the students in the high-reading ability group successfully determined the meanings for all words or almost all words.
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<th>t-Value</th>
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</table>

Note. CTR = rate of consulting; CSR = rate of successful consulting; CSPR = rate of successful/partially successful consulting; GTR = rate of guessing; GSR = rate of successful guessing; GSPR = rate of successful/partially successful guessing; COTR = rate of combined LPS use; COSR = rate of successful combined LPS use; COSPR = rate of successful/partially successful combined LPS use; ITR = rate of ignoring.

Table 4.23: Results of t-Tests with Reading-Ability Group as an Independent Variable for Rates of the Use of LPS Options and Success Rates of Determining Word Meanings
Table 4.23 continued

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</table>

**Reading comprehension and vocabulary learning.** Table 4.24 summarizes the mean scores, standard deviations, maximum/minimum scores, and ranges of the 22 students for the comprehension test, the multiple-choice vocabulary test, the rate of correct answers for the open-ended vocabulary test, and the rate of correct/partially correct answers for the open-ended vocabulary test. The mean for the comprehension test was 4.43 \((SD = 1.77)\) out of 6, and the mean for the multiple-choice vocabulary test was 3.55 \((SD = .96)\) out of 5. The means for the open-ended vocabulary test were 55\% (the rate of correct answers for the open-ended vocabulary test) and 64\% (the rate of correct/partially correct answers for the open-ended vocabulary test).
Table 4.24: Means and Standard Deviations in Comprehension Test Scores, V1 (Multiple-Choice Vocabulary Test) Scores, V2SR (Rate of Correct Answers for the Open-Ended Vocabulary Test), and V2SPR (Rate of Correct/Partially Correct Answers for the Open-Ended Vocabulary Test)

<table>
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<th>Min</th>
<th>Range</th>
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<td>6.0</td>
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</tbody>
</table>

The correlations of dictionary type with comprehension test scores, multiple-choice vocabulary test scores, the rate of correct answers for the open-ended vocabulary test, and the rate of correct/partially correct answers for the open-ended vocabulary test were calculated. The correlations of Vocabulary Levels Test scores with these test scores, and the correlations of TOEFL scores with these test scores, were also calculated. These correlations are summarized in Table 4.25. No moderate or substantial relationships were found between dictionary type and any of the test scores. Substantial relationships were found between Vocabulary Levels Test scores and comprehension test scores ($r = .685$), and between Vocabulary Levels Test scores and the rate of correct/partially correct answers for the open-ended vocabulary test ($r = .627$). A moderate relationship was found between Vocabulary Levels Test scores and the rate of correct answers for the open-ended vocabulary test ($r = .440$). A substantial relationship was found between TOEFL scores and comprehension test scores ($r = .550$). Moderate relationships were found between TOEFL scores and the rate of correct answers for the open-ended
vocabulary test ($r = .421$), and between TOEFL scores and the rate of correct/partially
correct answers for the open-ended vocabulary test ($r = .425$), although the association
with the rate of correct answers for the open-ended vocabulary test did not attain
statistical significance. Multiple-choice vocabulary test scores had only a low relationship
with Vocabulary Levels Test scores ($r = .244$), and a very low relationship with TOEFL
scores ($r = .131$). This may be because both high-proficiency and low-proficiency
students did fairly well on the multiple-choice vocabulary test, which mostly consisted of
the keywords for understanding the text.

<table>
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<th>Test</th>
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<th>TOEFL ($r$)</th>
<th>Dictionary Type ($r_{pb}$)</th>
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<tbody>
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<td>.550**</td>
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<td>.131</td>
<td>.000</td>
</tr>
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<td>.440*</td>
<td>.421</td>
<td>-.081</td>
</tr>
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<td>V2SPR</td>
<td>.627**</td>
<td>.425*</td>
<td>-.231</td>
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</table>

*p < .01, **p < .001.

Table 4.25: Correlations of Dictionary Type, Vocabulary Levels Test Scores, and TOEFL
Scores with Comprehension Test Scores, V1 (Multiple-Choice Vocabulary Test) Scores,
V2SR (Rate of Correct Answers for the Open-Ended Vocabulary Test), and V2SPR (Rate
of Correct/Partially Correct Answers for the Open-Ended Vocabulary Test)

The results of correlational analysis generally corroborated those of the $t$-tests. A
set of $t$-tests was carried out with dictionary type as an independent variable and each of
the test scores (comprehension test scores, multiple-choice vocabulary test scores, the
rate of correct answers for the open-ended vocabulary test, and the rate of
correct/partially correct answers for the open-ended vocabulary test) as a dependent
variable. No significant differences were found between the two dictionary groups for any of these test scores. Table 4.26 shows the results of the $t$-tests.

When looking at individual scores, however, there appear to be some differences between the ED and PD groups in comprehension test scores (see Appendix S). The three ED users who belonged to the low-scoring group in both vocabulary and reading had very low comprehension test scores (0, 1.0, and 2.5). These students also had low rates of guessing (.23, .16, and .26)
Another set of t-tests was performed with vocabulary-size group as an independent variable and each of the test scores (comprehension test scores, multiple-choice vocabulary test scores, the rate of correct answers for the open-ended vocabulary test, and the rate of correct/partially correct answers for the open-ended vocabulary test) as a dependent variable. Significant differences were found between the two vocabulary groups for comprehension test scores, \( t(20) = -2.355, p = .029 \), and the rate of correct/partially correct answers for the open-ended vocabulary test, \( t(12.037) = -2.853, p = .014 \). The large-vocabulary group scored higher than the small-vocabulary group in these tests. Table 4.27 shows the results of the t-tests.

<table>
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<th>p</th>
</tr>
</thead>
<tbody>
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</table>

<table>
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<th>( n )</th>
<th>Mean</th>
<th>SD</th>
<th>t-Value</th>
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**Note.** Comprehension = comprehension test; V1 = multiple-choice vocabulary test; V2 = open-ended vocabulary test; V2SR = rate of correct answers for the open-ended vocabulary test; V2SPR = rate of correct/partially correct answers for the open-ended vocabulary test.

Table 4.27: Results of t-Tests with Vocabulary-Size Group as an Independent Variable for Test Scores
Similarly, a set of $t$-tests was performed with reading-ability group as an independent variable and each of the test scores (comprehension test scores, multiple-choice vocabulary test scores, the rate of correct answers for the open-ended vocabulary test, and the rate of correct/partially correct answers for the open-ended vocabulary test) as a dependent variable. Significant differences were found between the two reading ability groups for all test scores, $t(20) = -3.576, p = .002$, $t(20) = -2.145, p = .044$, $t(20) = -2.628, p = .016$, $t(20) = -2.439, p = .024$, respectively. The difference found between the two reading-ability groups in multiple-choice vocabulary test scores, which was inconsistent with a low relationship found between TOEFL scores and multiple-choice vocabulary test scores ($r = .131$), seems to be due to an outlier. When another $t$-test was performed eliminating the outlier’s score, no significant difference was found between the two reading-ability groups in multiple-choice vocabulary test scores. Table 28 shows the results of the $t$-tests.
Table 4.28: Results of \( t \)-Tests with Reading-Ability Group as an Independent Variable for Test Scores

<table>
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<th>Comprehension</th>
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</table>

Note. Comprehension = comprehension test; V1 = multiple-choice vocabulary test; V2 = open-ended vocabulary test; V2SR = rate of correct answers for the open-ended vocabulary test; V2SPR = rate of correct/partially correct answers for the open-ended vocabulary test.

Qualitative Results

This section reports the results of qualitative analysis of retrospective think-aloud protocols, focusing on the differences between ED and PD users, and the differences between high- and low-proficiency students. Then, other recurring themes are presented, showing the general patterns of students’ LPS use regardless of dictionary type or proficiency group.

Differences between ED and PD users. ED and PD users appeared to differ in the timing of consulting a dictionary. Compared with ED users, overall, PD users took more time before consulting a dictionary without looking up unknown or difficult words.
right way, although one PD user appeared to jump right into using a dictionary. Four PD users read the whole text without using a dictionary at all or almost at all for the first time and used a dictionary for the second and third time. Four more PD users read a paragraph without a dictionary while marking unknown or difficult words and looked them up when they finished reading the paragraph. Delaying dictionary consultation appeared to have helped some PD users remember or guess at the meaning of unknown or difficult words. On the other hand, all ED users, except for two, looked up unknown or difficult words either immediately, after reading the following few words, or after the rest of the sentence. In particular, some ED users appeared to look up unknown or difficult words without thinking much, immediately after encountering unknown or difficult words or after reading the following few words.

A PD user, H. K., read the whole text without using a dictionary for all unknown or difficult words except for one word for the first time and used a dictionary for the second and third time. Even when she did not come up with the meanings of words in her first reading, she kept reading, which appeared to help her remember or guess at them with the aid of context:

1. C. K. What did you think about when you first saw air time?
   H. K. When I saw it for the first time, I was not very sure about its meaning.
   C. K. Then what did you do?
   H. K. I kept reading the text and found that [this paragraph] is about TV or something like that. I realized that on air means “broadcasting,” so I figured that don’t get much air time means “don’t get broadcasted much.”

   Similarly, another PD user, T.T., consulted a dictionary after she finished reading a paragraph. When she encountered unknown or difficult words, she kept reading until the end of the paragraph and eventually came up with the meanings for some of them:
2. C. K. What did you think about when you first saw outbreak?
   T. T. I have seen and looked up this word before.
   C. K. Then what did you do?
   T. T. I kept reading and somehow remembered its meaning. I think it means “to spread” or something like that, because the word contains out, and globally follows it.

   On the other hand, an ED user, N. S. (male), did not appear to think carefully before consulting a dictionary. He sometimes consulted a dictionary immediately and realized that he had known the words after looking them up. In the following excerpt, he realized that report means “repoto” (a Japanese loanword that came from English) after looking it up:

3. C. K. What did you think about when you first saw reported?
   N. S. I had no idea.
   C. K. Then what did you do?
   N. S. I looked it up and found that I knew it. I should have looked at it more carefully. I would have figured out its meaning.
   C. K. What did you find in the dictionary?
   N. S. It just means “repoto.”

Since PDs did not allow them to look up a word quickly, many PD users may have waited to consult a dictionary until they finished reading the whole text or a paragraph. They might have been afraid that time-consuming consulting would have interfered with their comprehension processes, as a PD user stated:

4. C. K. Do you usually read a paragraph without a dictionary and look up unknown words afterwards as you just did?
   S. F. Yes, I do most of the time. Because I will be distracted and fail to understand the text if I look up an unknown word every time I see it.

   In contrast, since EDs enabled a quick consultation, many ED users may have consulted a dictionary without reading until the end of a paragraph or the text, as an ED user stated. The following excerpt suggests that he looked up unknown words immediately, even though he suspected that it might not help him retain them:
5. C. K. Do you usually look up words immediately after encountering them [as you just did]?

Y. M. Yes, I do. I think that it is better not to use a dictionary immediately. [If I did not look up a word in the dictionary immediately], I would retain them better. But it is time-consuming. So I look up unknown words mechanically without thinking too much.

The finding that some PD users took more time processing unknown or difficult words before dictionary consultation than some ED users appeared to be supported by the differences between some PD and ED users in the frequencies of consulting and inferring (see Appendix S). Some ED users consulted a dictionary more often than some PD users. Only one PD user looked up all unknown or difficult words. On the contrary, six ED users consulted a dictionary for all or almost all unknown words (more than 90%), although two ED users consulted a dictionary sparingly only for selected words.

There were two PD users who guessed at more than 80% of unknown or difficult words. Moreover, there were 10 PD users who guessed at 50% or more than 50% of unknown or difficult words. On the other hand, there were six ED users who guessed at 50% or more than 50% of unknown or difficult words. Also, there were four ED users who guessed less than 20% of unknown words.

Some PD users had dictionaries for high school students, and these dictionaries did not contain less common words. For example, five PD users could not find the word *avian*, and two PD users could not find the word *resold* in their dictionaries, whereas all ED users who looked up these words found them in their dictionaries. The PD users who did not find these words in their dictionaries had to either guess at or ignore these words. This might have negatively affected comprehension of the text for some of them. In particular, since the word *avian* in *avian flu* was one of the keywords of the text used in
the session, the consequence of not finding it in the dictionary and not knowing the exact meaning might have been serious. Only one out of the five PD users who could not find the word in their dictionaries guessed at its exact meaning from context. Others came up with an only partially correct meaning (i.e., “a kind of illness”), or a wrong meaning. Y. F. made a wrong guess about its meaning, looked it up, did not find it in the dictionary, and gave up:

6. C. K. What did you think of when you first saw avian flu?
Y. F. “Some kind of substance.”
C. K. Why did you think so?
Y. F. Because there were such words as eggs, meat, and chickens near the word.
C. K. Then what did you do?
Y. F. Since I did not know the [exact] meaning, I looked it up in the dictionary.
C. K. What did you find out?
Y. F. Since it was not in the dictionary, I gave up.
C. K. Are you talking about avian?
Y. F. Yes, I am. But I did not find flu in the dictionary, either.
C. K. Then did you skip them?
Y. F. Yes, I did. I thought that I would be able to come up with their meanings when they appeared in the text again.

According to her, Y. F. did not find the word flu, either. Therefore, she did not know the meaning of avian flu at this point, although she might have figured some meaning later as she kept reading the text.

Some ED users, especially those who had been using their EDs for a while, took advantage of various functions of their EDs. Some functions might have positively impacted dictionary consultation, but others might have negatively affected it. All EDs had the function that displays the list of words containing the letters as the user types them. A user could look up a word that he or she is not sure how to spell by using this function (Denshi Jisho Kenmei PW-9700). Some ED users took advantage of this
function and chose the words that they searched for from the lists as they typed. Some students used this function to avoid typing. When she was asked about this function, M. N. stated:

7. C. K. I realized that you typed the first letters and chose the words that you were looking for from the lists. Why do you do that?
M. N. I find it troublesome to find the letters [on the keyboard].
C. K. Can you do searches faster in that way?
M. N. Yes, I can.

Some students used the word lists to see if their dictionaries contain the word, or the form of the word that they were looking for. Y. A. found the meaning of the compound *level-headed* successfully by using this function:

8. C. K. What did you think about when you first saw *level-headed*?
Y. A. I wondered if *level* is the same [level] as is used in phrases such as *easy level* and *difficult level*. So I looked up *level-headed*, expecting that *level-headed* had such a meaning [i.e., “standard”]. It turned out to have a completely different meaning.
C. K. [based on the field notes] Did you see the word *level-headed* in the list when you typed *level*?
Y. A. Yes, I did. So I figured out this is one word.
C. K. What did you find out?
Y. A. Although it looked like it consists of two words, it is one word, and it means “calm and sensible.”

However, this word list did not always appear to have a positive influence. It appeared to prompt some low-proficiency ED users who were relatively weak at grammar to confuse a participle as an adjective with a participle as a verb. When he encountered participles, N. S. (male) usually typed them with inflections regardless of whether they are adjectives or verbs. If they were not in the list, he removed inflections. When he encountered *topped* as a verb meaning “to be in the highest position,” he typed the word with the inflection in his ED and found the adjective *topped* meaning “covered.” This significantly affected the comprehension of the word:
9. C. K. What did you find out in the dictionary?
   N. S. The word means “covered.”
   C. K. Did you find it easily?
   N. S. Yes, I did.
   C. K. Do you think the meaning is appropriate for the context?
   N. S. Yes, I do.
   C. K. Did you find anything else?
   N. S. No, I did not.
   C. K. [based on the field notes] Did you look up this word in the form of topped?
   N. S. Yes, I did.
   C. K. Do you usually look up verbs with inflections? Then if they are not listed in the dictionary, do you remove them?
   N. S. Yes, I do.

   Another function that some ED users took advantage of was a jump function that enables them to move from one entry to another entry within one dictionary and from one dictionary to another dictionary. Y. H. looked up resold, found that it is the past participle form of resell, and jumped to resell:

   10. Y. H. I thought this [resold] is the past participle of resell. I looked up resold, confirmed that it is the past participle of resell, and jumped to resell.

   In contrast, PD users, who did not know resold, had to look up resold, find its basic form resell, and look up resell again.

   To summarize the differences between ED and PD users, they appeared to differ in the timing of consulting, the processing of words before consulting, and the frequency of consulting. On the whole, PD users appeared to take more time and effort to guess or remember words before consulting a dictionary. These differences might have resulted from the relative ease of searching with EDs. Some PDs had a smaller number of headwords, compared with some EDs. Also, EDs had functions that were not available in
PDs. These functions might have both negatively and positively affected students’
dictionary behavior.

**Differences between high- and low-proficiency students.** A major difference
between high- and low-proficiency students in their LPS use emerged in their use of
context. Overall, high-proficiency students skillfully used both immediate (e.g., word
structures, sentence structures, and surrounding words) and wider contexts (e.g., the
general idea of the text or paragraph and the general knowledge of the topic) when
guessing at word meanings, choosing contextual meanings from those listed in the
dictionary, or modifying dictionary information. In contrast, most low-proficiency
students depended heavily on immediate contexts, in particular on word structures. When
low-proficiency students used wider contexts, it generally turned out to be unsuccessful.

For example, a high-proficiency student, R. O., guessed at the meaning of *avian*
by looking at surrounding words (immediate context) and checked the guessed meaning
against the topic of the article (wider context):

11. C. K. What did you think about *avian*, when you first saw it?
    R. O. I did not think of anything when I first saw it [in comprehension
    questions], but, as I read the text, I found that the word *chicken* appears [in
    the same sentence]. So I thought this article was about avian flu and did
    not look it up.
    C. K. Did you guess at the meaning from the context?
    R. O. Yes, I did.
    C. K. Do you think it is appropriate for the context?
    R. O. I don’t know. It may be wrong [because I didn’t look it up in the
dictionary].
    C. K. Why didn’t you look it up?
    R. O. This article also mentions BSE [bovine spongiform encephalopathy] so I
    was confident about the guessed meaning.

Although she did not find the compound *fearmonger* in the dictionary, another
high-proficiency student, N. S. (female), looked up *monger*, modified the dictionary
information by using the main idea of the article or the paragraph (wider context), and figured out the meaning of *fearmonger*:

12. C. K. What did you find out [in the dictionary]?
   N. S. *Fearmonger* itself was not in the dictionary, but *monger* was in the dictionary. I found that *monger* means “a dealer.” I thought it made sense if *fearmonger* meant “a person who deals with fear” because this paragraph is talking about mass media.

   On the other hand, many low-proficiency students were not skilled in using wider contexts. H. O. attempted to guess at the meaning of *fearmonger* by analyzing the word structure (immediate context). Then, she looked up *fearmonger* and did not find it in the dictionary. Next, she looked up *monger* and modified the dictionary information by associating the word with the information that she found in the paragraph containing it (wider context):

13. C. K. What did you think about when you first saw it?
   H. O. I thought that since *fear* meant to “feel afraid,” *fearmonger* was something like “to feel afraid.”
   C. K. Then what did you do?
   H. O. I looked it up, but I could not find it. So I looked up *monger* and found that it means “a dealer,” but I did not know what *fear* meant.
   C. K. What did you think it meant as a whole?
   H. O. I thought it meant “a person who is in the food business.”
   C. K. Is it because *monger* means “a dealer”?
   H. O. Yes, it is.

   H. O. may have thought that *fearmonger* meant “a person who is in the food business,” because the paragraph containing this word mentions *restaurants and other businesses* earlier in the paragraph. She settled on the meaning, although she realized that the meaning of *fear* is lost. This failure in determining its meaning seemed to occur because she paid attention to particular information in the paragraph rather than the general idea.
of this paragraph, whereas fearmonger is the keyword that summarizes this paragraph as well as the whole article:

Some low-proficiency students depended on word structures (or word shapes) when they guessed at word meaning. J. S. thought browser in Web browser meant “a person” by analyzing the structure of the word:

14. C. K. What did you think about when you first saw browser?
    J. S. I thought browser meant “a person” because it contains er.
    C. K. Then what did you do?
    J. S. I looked it up in the dictionary.
    C. K. What did you find out?
    J. S. It means “a person who looks through books” or “cows that eat leaves.”

The word browser appears in the phrase close that Web browser. Although the affix er means “a person” in some contexts, browser cannot mean “a person” in this context. She appeared to focus on the structure of the word rather than the context where it appears, when she guessed at its meaning. Since the subsequent dictionary consultation also did not help, she appeared to end up misunderstanding it.

Some low-proficiency students confused the words that looked similar, when they guessed at the meaning of unknown words. Y. F. appeared to confuse authority with author, partially because they look similar and partially because there is report near the word:

15. C. K. What did you think about when you first saw authorities?
    Y. F. I thought it meant “people.”
    C. K. Why did you think so?
    Y. F. Because people write reports.
    C. K. Then what did you do?
    Y. F. I did not look it up because I was confident about that.
    C. K. Were you confident that it meant “people”?
    Y. F. I wondered why it meant “writers.” It could mean “authors.”
Before they chose an appropriate sense from those listed in the dictionary for an unknown or difficult word, some high-proficiency students tried to carefully understand the words surrounding it. When they were not sure about a surrounding word, they looked up the unknown word, looked up the surrounding word, and compared two entries before choosing an appropriate meaning. H. K. looked up *squeal*, then looked up the surrounding word *delight*, compared the two entries, and decided on the meaning of *squeal*:

16. C. K. [based on the field notes] Did you look up *squeal*, then look up *delight*, come back to *squeal*, and write down the meaning of *squeal*?
   H. K. When I looked up *squeal*, I found several senses and couldn’t choose from them. So I [looked up *delight* and] compared the two entries to look for the Japanese translation for *squeal of delight*.

Some low-proficiency students had difficulty choosing an appropriate sense from those listed in the dictionary for polysemic words (e.g., *state*) and homonyms (e.g., *present*, *grave*). M. N. appeared to look up the homonym *present* and choose the adjective meaning “current,” which does not make sense in the context (i.e., *present a risk*). She appeared not to check it carefully against the context:

17. C. K. What did you find in the dictionary?
   N. M. I found that it means “current.”
   C. K. Did you find it easily?
   N. M. Yes, I did.
   C. M. Do you think that it is appropriate for the context?
   N. M. Yes, I do.

Some low-proficiency students, like N. M., might have had this kind of problem, partially because they did not carefully take into account the context where a word appears and partially because they did not understand the context very well due to the lack of either vocabulary or syntactic knowledge.
Many high-proficiency students skillfully modified the dictionary information so that it fits the context, as it is shown in Excerpt 12. On the other hand, some low-proficiency students failed to modify the dictionary information, as shown in Excerpt 13. Other instances are given below. In Excerpt 18, a high-proficiency student, N. S. (female), skillfully modified the meaning of *bombard* to fit the context. In contrast, in Excerpt 19, a low-proficiency student, S. S., accepted the sense of *tone* found in the dictionary (i.e., “a shade of color”) as it is. As she was not confident about it herself, the sense does not fit the context (i.e. *in a grave tone*):

18. C. K. What did you think about when you first saw *bombard*?
   N. S. Since it contains *bomba* [a Japanese loanword], I thought that it meant “explosion.” But it does not fit the context, so I looked it up in the dictionary. I could not find any other senses, so I wrote down “simile” and “to open fire.”
   C. K. Does it mean that you have to modify it yourself?
   N. S. I tend to forget the beginning when I reread the text, so I wrote down “simile” so that I would not literally understand it as “to open fire.”
   C. K. Does it mean that *bombard* is used as a simile?
   N. S. Yes, it does.
   C. K. Didn’t you find an appropriate meaning in the dictionary?
   N. S. No, I didn’t.
   C. K. What did you think it meant?
   N. S. I thought that it meant “to give a strong impact.”

19. C. K. What did you find out [by looking up *tone* in the dictionary]?
   S. S. “A shade of color.”
   C. K. Do you think it is appropriate?
   S. S. I was not confident. But I wrote it down anyway.

Many high-proficiency students used a dictionary selectively and strategically. When using a dictionary, they prioritized the words that were relevant to comprehending the text, were main elements of sentences, were relevant to answering comprehension questions, or were not guessed. They did not look up the other words at all or they looked them up in the second and third reading. Y. K. did not look up *there-to* (that she thought
was an idiomatic expression) because it was not relevant to answering comprehension questions:

20. C. K. What did you think about when you first saw *there-to*?
    Y. K. This paragraph is basically talking about BSE, so I thought that this word was not related to answering comprehension questions. So I thought that I didn’t have to read this paragraph carefully and did not look it up.

Another high-proficiency student, S. N. (female) did not look up the word *jeopardy* because she was able to guess at its meaning vaguely and thought she did not have to know the exact meaning of the word to comprehend the text:

21. C. K. What did you think about when you first saw *jeopardy*?
    N. S. I thought that it had a negative meaning.
    C. K. Did you think so because of the context?
    N. S. Yes, I did.
    C. K. Then what did you do?
    N. S. I skipped it.
    C. K. Why did you skip it?
    N. S. I thought that I would not have any difficulty continuing to read the rest of the text even if I did not know the exact meaning of the word.
    C. K. Do you mean that you would not have any difficulty understanding the rest of the text?
    N. S. Yes, I do.

Another high-proficiency student, M. T., appeared not to look up the conjunctive adverb *likewise* in the first reading because she was able to guess at its meaning and because she found that it is not the main element of the sentence that is necessary to comprehend the text:

22. C. K. What did you think about when you first saw *likewise*?
    M. T. I thought it meant “in a similar way” because it contains *like*.
    C. K. Then what did you do?
    M. T. I skipped it for the first time because it is a conjunction. I thought I didn’t have to know its exact meaning. But I looked it up for the second time because I was not sure.
Similarly, some low-proficiency students attempted to use a dictionary selectively for the words that they thought were relevant to comprehending the text, were relevant to answering comprehension questions, or were not guessed. However, their criteria of importance were sometimes intuitive and did not make sense objectively. M. M. appeared to look up the word *scary* because she noticed that the word is in the double quotation marks and thought it was important for comprehension:

23. C. K. What did you think about when you first saw *scary*?
M. N. I have seen it, but could not remember it. So I looked it up.
C. K. Why did you look it up?
M. N. I thought that it was important because it is in the quotation marks.

M. N. thought that *scary* was important for comprehension because it is in the quotations marks. However, actually, *scary* is in the quotation marks not because it is emphasized but because it is part of what the mother-in-law says.

The frequency of consultation reflects the differences in strategic and selective choice of use between some high-proficiency and low-proficiency students (see Appendix S). There were three high-proficiency students who looked up less than 30% of unknown or difficult words, while five other high-proficiency students looked up more than 50% of unknown words, and two of them looked up 100% of unknown or difficult words. One student who had high proficiency in vocabulary and low proficiency in reading ability also looked up less than 40% of unknown or difficult words. On the other hand, all low-proficiency students looked up more than 50% of unknown or difficult words. In particular, there were four students who looked up more than 80% of unknown or difficult words. Also, one student who had low proficiency in vocabulary and high proficiency in reading ability looked up more than 90% of unknown or difficult words.
This may be partially because low-proficiency students did not know surrounding words and were unable to infer word meaning. For these students, selective dictionary consultation might not have been an option. In particular, there were four low-proficiency students who guessed less than 20% of unknown or difficult words. These four students had a higher percentage (70-90%) of difficult/unknown words in the text.

Some high-proficiency students looked at a variety of information, including contextual meanings, other meanings, part of speech, pronunciation, examples, and usage and grammatical information, when they consulted a dictionary. M. T. came up with the meaning of the word *fearmonger* by looking at the similar example *rumormonger*:

24. M. T. I tried to look up this word [i.e., *fearmonger*] as one word, but I could not find it. So I looked up only the latter half *monger*.  
   C. K. What did you find out?  
   M. T. I found the meaning “a person who spread gossip.”  
   C. K. Did you look at an example?  
   M. T. Yes, I did.  
   C. K. Why did you look at the example?  
   M. T. I thought that *fearmonger* itself might be listed as an example.  
   C. K. Was it listed as an example?  
   M. T. No, it wasn’t. But I found the similar expression *rumormonger* that means “a person who spread rumors.” So I thought about the meaning of *fearmonger* based on *rumormonger*.

Likewise, Y. H. looked at synonyms and usage information in addition to meaning when she looked up *let alone*:

25. C. K. What did you find out [by looking up *let alone*]?  
   Y. H. I found the meaning “needless to say” and the synonymous expression *to say nothing of*. I also read the usage information that says that it is used after negative statements. I looked at the text and checked that the proceeding sentence contains *never been*.

Some low-proficiency students who were weak at grammar had difficulty looking up participles. They confused participles as adjectives with those as verbs. There were
three low-proficiency students who looked up the verb *struck* (in *a crisis had struck Japan’s food supply*) as an adjective and failed to comprehend it. For example, M. N. looked it up as an adjective, was confused with the meaning that she found, and gave up:

26. C. K. What did you think about when you first saw *struck*?
   M. N. I remember that it appears in an English song.
   C. K. Then what did you do?
   M. N. I skipped it.
   C. K. [based on field notes] No, you did not skip it. You looked it up in the dictionary.
   M. N. I looked it up, but could not understand the meaning. “Closed by a strike of workers.” I did not know how to translate it.

To summarize the differences between high- and low-proficiency students, they differed in the use of context. High-proficiency students skillfully used wider and immediate contexts when they guessed at word meanings, chose contextual meanings from those listed in the dictionary, or modified dictionary information. In contrast, low-proficiency students were unable to use wider contexts skillfully and depended on immediate contexts, particularly on word structures or shapes. High-proficiency students also used a dictionary more strategically for the selected words than low-proficiency students. Furthermore, some high- and low-proficiency students differed in the types of information that they looked at in the dictionary and the skills in handling participles.

There were six students who belonged to different groups in terms of vocabulary and reading ability. Three of them had high proficiency in vocabulary and low proficiency in reading ability, whereas the other three had high proficiency in reading and low proficiency in vocabulary. These students appeared to fit roughly the patterns of either high- and low-proficiency students in terms of their reading ability. Namely, roughly speaking, those who had high proficiency in vocabulary and low proficiency in
reading had similar patterns as low-proficiency students. On the other hand, those who had low proficiency in vocabulary and high proficiency in reading had similar patterns as high-proficiency students.

Those who had low proficiency in vocabulary and high proficiency in reading skillfully used both immediate and wider contexts when guessing at word meanings, choosing contextual meanings from those listed in the dictionary, or modifying dictionary information, as high-proficiency students did. For example, Y. M. successfully used the wider context (the topic of the text) to guess at the meaning of *avian*:

27. C. K. What did you think about when you first saw *avian*?
Y. M. I thought that it probably meant “a bird,” but I looked it up in the dictionary.
C. K. Why did you look it up when you already figured out its meaning?
Y. M. This article is about current issues, so I figured out that it means “a bird” [in *bird plague*]. But I wanted to confirm that.

Similarly, another student who had low proficiency in vocabulary and high proficiency in reading, K. Y., carefully examined the immediate context (surrounding words) to decide on the meaning of *squeal*. As a high-proficiency student, H. K. did in Excerpt 16, K. Y. looked up *squeal* (appearing in the phrase *squeals of delight*), looked up *delight*, and then decided on the meaning of *squeal*:

28. C. K. What did you think about when you first saw *squeal*?
K. Y. I had no idea, so I looked it up immediately.
C. K. What did you find out?
K. Y. I found two senses, “complaint” and “scream.” At first, I thought that “complaint” was more appropriate, but I looked up *delight* and found that it means “pleasure,” so I thought that “scream” was more appropriate.

In contrast, those who had high proficiency in vocabulary and low proficiency in reading ability were not very skilled in using wider or immediate contexts, as low-
proficiency students were. For example, S. T. had difficulty choosing the meaning for the homonym *present* and chose the meaning that does not fit the context (i.e. *present a risk*):

29. C. K. What did you find out [in the dictionary]?
   S. T. There are many senses listed in the dictionary. Honestly speaking, I am not confident about my choice, but I chose the one that I thought was the most appropriate [i.e., “introduces”].

Likewise, another student who had high proficiency in vocabulary and low proficiency in reading ability, Y. A., was unable to choose the contextual meaning from those listed in the dictionary for *regular* in *regular pneumonia*:

30. C. K. What did you think about when you first saw *regular*?
   Y. A. I thought that *regular* just meant “following a pattern,” but it is in the quotation marks. So I though that it had a more specific meaning and looked it up in the dictionary. Then I found that it can mean “life that follows a pattern,” so I decided on this sense.

In summary, high-proficiency and low-proficiency students differed in their use of wider and immediate contexts when they employed LPSs. Six students who belonged to different groups in terms of vocabulary and reading ability appeared to conform to the patterns of high- or low-proficiency students in terms of their reading ability.

**Recurring themes.** Although some students strategically decided which words to consult and/or when to consult them, an overall impression was that most students depended heavily on a dictionary. Many students were concerned about translating a text word by word by consulting a dictionary when they did not need to do so for general comprehension of the text. Moreover, many students were concerned about translating words into proper Japanese. This may be because they had been required to translate a text into Japanese word-by-word in their English classes and had been accustomed to doing so. Another reason may be that they were asked to answer comprehension
questions in Japanese, although comprehension questions were designed to assess general comprehension of the text.

Many students depended on a dictionary. Seven students looked up all or almost all unknown or difficult words in the dictionary (more than 90%). In particular, some students often consulted a dictionary to confirm word meanings that they already knew, because they were not completely confident about them. For example, S. S. looked up all unknown or difficult words, including those that she already knew, until she ran out of time and decided to use a dictionary selectively from that point:

31. C. K. What did you think about when you first saw suggest?
   S. S. I thought that it meant “to propose,” but I was not confident. So I looked it up.
   C. K. What did you find out?
   S. S. I found that it means “to propose” as I thought and wrote it down.

Many students were concerned about translating a word into proper Japanese. In the following excerpt, S. F. looked up the word wrong in the dictionary to look for a “proper Japanese equivalent,” although he had known its meaning:

32. C. K. What did you think about when you first saw wrong?
   S. F. I knew its several senses, but I did not know how to translate it into Japanese. So I looked it up in the dictionary to look for a proper Japanese equivalent.
   C. K. What did you find out?
   S. F. I could not find a good equivalent. Although I found the meaning “morally wrong,” I found it difficult to translate this word into Japanese.

Similarly, Y. H. looked up the word wonder because she did not come up with a “beautiful” or proper Japanese equivalent. She looked it up even though she appeared to understand it:
33. C. K. What did you think about when you first saw *do wonders*?
   Y. H. I did not know how to translate it into beautiful Japanese, so I looked it up because I thought that I needed to know it to answer comprehension questions.

   Many students had difficulty looking up compounds, such as *fearmonger*, *mother-in-law*, and *level-headed*. Students frequently used the strategy of dividing a word into parts and looking them up separately, as illustrated in Excerpts 12 and 13. However, some students avoided looking up compounds. One of them, Y. Y., guessed at the meaning of *level-headed* without looking it up because he thought that the search would not be easy:

34. C. K. What did you think about when you first saw *level-headed*?
   Y. Y. I thought that it meant “a kind of level.”
   C. K. Then what did you do?
   Y. Y. I thought that I could skip it because I was able to guess at its meaning partially. I figured out that it means “a kind of level.” I thought that I didn’t have to know the exact meaning. Also, I thought that I would not find it in the dictionary easily, because it contains a hyphen. So I thought that I had to guess at its meaning without consulting a dictionary.

   Many students guessed at the part of speech before consulting a dictionary, which appeared to help them choose the contextual meaning from the senses listed in the dictionary. In Excerpt 35, M. T. figured that the part of speech of *wonder* in *do wonders* was a noun before consulting a dictionary and did so successfully. On the contrary, in Excerpt 36, H. K. appeared to think that the part of speech of *wonder* in *do wonders* was a verb and failed to find an appropriate meaning for the word:

35. C. K. What did you think about when you first saw *wonder*?
   M. T. I thought that *wonder* was a verb, but there is *does* before *wonder*. I thought that it might be a noun, but the meaning as a noun that I knew was only “something surprising,” so I looked it up in the dictionary.
   C. K. Then what did you do?
   M. T. I found that *do wonders* is an idiom that means “to have a very good effect.”
C. K. Did you find it easily?
M. T. I went to the screen that lists idioms. I first looked at the meanings as a noun, but I only found such meanings as “feeling of surprise” and “something surprising.” So I thought that do wonders was an idiom.

36. H. K. I thought that wonder meant something else than what I knew and looked it up.
C. K. What was the meaning that you knew?
H. K. I thought that it meant “to feel surprised.” I looked it up and found that it has different meanings when it is used as a transitive and an intransitive. It means “to feel surprised” or “to doubt.” I did not think that either one made sense.

Some students had difficulty understanding the definitions or meanings given in the bilingual dictionary because they did not understand formal Japanese used in the dictionary. H. O. looked up authority and found a Japanese equivalent (ken’i), but did not understand it very well:

37. C. K. What did you find out by looking it [authority] up in the dictionary?
H. O. “Ken’i [a person with special knowledge].”
C. K. Did you find it easily?
H. O. Yes, I did. There were several meanings, but I thought that it was the most appropriate.
C. K. Are you confident about the meaning that you chose?
H. O. I don’t understand the meaning of ken’i.
C. K. Do you mean the meaning of the Japanese word?
H. O. Yes, I do. I don’t understand it very well.

All students depended on immediate contexts to guess at word meaning although some students, especially high-proficiency students, also used wider contexts. They used immediate contexts, such as word structures/word shapes, sentence structures/surrounding words, and Japanese loanwords. Their guesses were also influenced by their past experiences with words.

Many students used sentence structures or surrounding words to guess at word meaning. In particular, they used this kind of information when they guessed at the
meanings of the words that connect with other words by using conjunctions such as and and or. For example, M. S. guessed at the meaning of pneumonia partially successfully by using the structure of the sentence containing it:

38.  C. K.  What did you think about when you first saw pneumonia?
M. S.  It is connected with influenza by and, so I figured out that it is “a kind of illness” and moved on.

Similarly, some students were able to partially correctly guess at the meaning of the words, such as reassure and mumble, by noticing that they appear after remarks. Y. A. guessed at the meaning of the word mumble by using this information:

39.  C. K.  What did you think about when you first saw mumble?
Y. A.  It follows the remark that’s scary, so I thought that it described “a kind of speaking.” Then I looked it up and found the meaning that I expected. I found that it means “to speak too quietly or not clearly.”

Other frequently used sources of inferring were Japanese loanwords. Many students were able to guess at the meanings of the words such as bombard, announcer, and globally by using their Japanese knowledge. Most of these guesses were successful. Y. N. was able to successfully guess at the meaning of bombard by associating it with bomba (a Japanese loanword meaning “bomb”):

40.  C. K.  What did you think about when you first saw bombard?
Y. N.  I did not know this word, but it is related to bomba, so I thought it was synonymous to the words like strike.

Likewise, T. H. was able to successfully guess the meaning of announcer, by drawing on the Japanese loanword anaunsa, although she had to double-check it in the dictionary:

41.  C. K.  What did you think about when you first saw announcer?
T. H.  Just anaunsa.
C. K.  Do you mean anaunsa in Japanese?
T. H.  Yes, I do.
C. K. Then what did you do?
T. H. I looked it in a dictionary because I was not sure how to pronounce it. I checked the spelling and found that it means “anaunsa”.

Furthermore, many students analyzed word structures or shapes to guess at the meanings of the words consisting of several parts, such as *uptight* and *level-headed*. R. O. guessed at the meaning of the word *uptight* by dividing it into *up* and *tight*:

42. C. K. What did you think about when you first saw *uptight*?
R. O. *Tight* means “attached firmly,” and *tight[en]* *up* means “to fasten firmly.” I thought that *uptight* was a noun, an adjective, or a passive voice that originates from it.
C. K. Then what did you do?
R. O. I did not look it up because I roughly understood it.

Similarly, S. T. was able to guess at the meaning of the word *level-headed* partially successfully in that it generally fits the context. He guessed at its meaning by dividing it into *level* and *headed*, although he also drew on surrounding words:

43. C. K. What did you think about when you first saw *level-headed*?
S. T. I thought that it was related to the numerical value because it contains *level*.
C. K. Then what did you do?
S. T. I tried to understand it in the sentence containing it.
C. K. What did you think it meant?
S. T. Something like *high-level*.
C. K. Did you think so because it consists of *level* and *headed*?
S. T. Yes, I did. Also, I noticed that *analysis* follows it.

Many students remembered the situations where they previously encountered the word, such as in class, in a vocabulary notebook, in a vocabulary test, and in an entrance examination. Some of them came up with a meaning that does not make sense at all, suggesting that they mixed up the word with other words that appeared in the situations. Y. F. remembered seeing *compare* in a vocabulary test, but appeared to confuse it with
another word. The strange meaning that she came up with can be explained only this way:

44. C. K. What did you think about when you first saw compare?
Y. F. I remember that it appeared in a vocabulary test. I thought that it meant “to divide,” but it did not make sense because there were old and traditional in the same sentence, so I decided to look it up.

Some students were able to vaguely guess at the meanings of some words or came up with only their images. However, a vague understanding of words probably means a great deal when it comes to reading comprehension or vocabulary learning. In the following excerpt, Y. M. realized that fearmonger is an important word that summarizes the article, although he did not come up with a specific meaning before consulting a dictionary:

45. C. K. What did you think about when you first saw fearmonger?
Y. M. I thought this was as an important word as it could be a title of this article, so I thought it had a deep meaning in a sense.
C. K. Do you mean it is the keyword to understand this article?
Y. M. Yes, I do. I looked up fearmonger, but I could not find it. So I looked up monger and found the meaning “a dealer.” I could not find anything else in the dictionary. But, as I read the text, I figured out that it may mean “mass media.”

The vague understanding of this word before consulting a dictionary may have helped him comprehend the text and come up with the appropriate meaning of the word, as he continued to read the text.

Similarly, R. O. came up with only the image of bombard. As she stated, the vague understanding of this word may have enough to comprehend the text or answer comprehension questions:

46. C. K. What did you think about when you first saw bombard?
R. O. I thought that it had a negative meaning.
C. K. Why did you think so?
R. O. I thought so because *scary* follows it.
C. K. Then what did you do?
R. O. I did not look it up because I did not think that it was important for answering comprehension questions.

All students, except for three, mainly wrote down contextual meanings in the margins, after consulting a dictionary. Many of them appeared to do so to be able to recall them and/or to translate them, when they came back to the part of the text. In particular, several students wrote down the meanings of unknown words as well as those of the words that they already knew. For example, T. H. wrote down the meaning of the word that she had already looked up and written down:

47. C. K. Why did you look up *entire* again?
T. H. Because I forgot its meaning.
C. K. Do you mean that you remember looking it up, but did not remember its meaning?
T. H. Yes, I do.
C. K. Why did you look it up again rather than looking at the notes that you previously took? Do you usually do so?
T. H. Yes, I do.
C. K. Then, why do you take notes?
T. H. Because it makes it easier to translate a text.
C. K. Do you take notes to translate a text rather than to remember word meanings?
T. H. Yes, I do.

There were three students who did not take any or almost any notes after consulting a dictionary. They remembered word meanings without notes fairly well. These students appeared not to take notes as a strategy of memorizing words. For example, S. F. stated:

48. C. K. Don’t you take notes because you think it helps you remember words [as you did today]?
S. F. I don’t take notes so that I can check if I remember them when I reread a text.
Some students also wrote down pronunciation for some words whose pronunciation is not transparent (e.g., pneumonia, subsequent). H. K. wrote down the pronunciation in addition to the meaning for pneumonia because she did not know how to pronounce it:

49. C. K. What did you think about when you first saw pneumonia?
H. K. I did not how to pronounce it. I thought that it was a word not used in daily life and had no idea what it meant.
C. K. What did you find out?
H. K. I found its meaning and pronunciation.
C. K. [based on field notes] Did you write down the pronunciation on the text as well as mark it in the dictionary?
H. K. Yes, I did.

Some students wrote down several meanings when they were unable to choose a contextual meaning as shown in Excerpt 50. When she was asked why she wrote down two senses for fearmonger, she answered as follows:

50. C. K. Do you usually write down several meanings for a word?
K. Y. It depends. The two meanings [i.e., “a dealer” and “a person who spreads a rumor”] were very different, [and I did not know which one to choose]. When I don’t know which meaning to choose, I usually write down both meanings.

In summary, many students depended on a dictionary. In particular, some of them consulted a dictionary when they might not have needed to. Also, some students were too anxious to find appropriate Japanese equivalents. This may be partially explained by the grammar-translation method in which they had learned reading skills. Although many students frequently consulted a dictionary, some students had some problems with dictionary consultation. Some students had difficulty looking up compounds. Some students had difficulty understanding Japanese definitions. Some students did not
successfully look up a word in the dictionary because they did not guess at its part of speech beforehand.

Although many students depended on a dictionary, they also frequently guessed at word meanings by drawing on immediate cues such as word structures, sentence structures/surrounding words, Japanese loanwords, and past experiences. Many students sometimes came up with only vague meanings or images of words. In some cases, the vague meanings or images of words may have significantly helped them comprehend the text or the words.

Finally, many students mainly wrote down contextual meanings in the margins of the text after consulting a dictionary, whereas a few students did not intentionally take notes to facilitate retention.

Discussion

The retrospective think-aloud protocols collected during the reading session, the reading test administered during the session, and the vocabulary tests administered after the session revealed the LPS use of the 22 Japanese university students and its relation to vocabulary learning. This section discusses the main findings of the reading session by combining qualitative and quantitative findings whenever possible in relation to those of other studies. It focuses on the findings such as: overall rates of use of LPSs, overall success rates of LPS use, overall rates of word retention, impact of EDs on their LPS use and vocabulary learning, the relationship between English proficiency and LPS use, and recurring patterns of the students’ LPS use.

This study indicated that on average, the Japanese university students looked up in a dictionary 69% of unknown or difficult words, inferred 52%, looked up after
inferring 31%, and ignored 10%, although great individual differences were found. These results showed that the students consulted more words and ignored fewer words than those in previous studies. For example, Fraser (1999a) found that when they encountered unfamiliar words in reading, the students consulted a dictionary only 39% of the time and consulted after inferring 18% of the time. On the other hand, they inferred 58% of unfamiliar words and ignored 32% of them. Similarly, Paribakht and Wesche (1999) found that the students ignored approximately half of unknown words and inferred almost 80% of the words that they attended to, whereas they seldom consulted a dictionary or the interviewer.

Since LPS use appears to depend on many factors, including the textual feature (length, readability, etc.), the characteristics of the learner (proficiency, experience, etc.), the nature of the word (length, word class, etc.), and the nature of the task (writing a summary, answering comprehension questions, etc.), there are many possible reasons that the present study found a higher rate of consulting and a lower rate of ignoring than the previous studies. First, this may be because the subjects of the present study were EFL students, although the subjects of the previous studies were ESL students. The EFL students perhaps read the text more intensively than the ESL students in the previous studies because of their familiarity with this style; they were usually required to read limited material with maximum comprehension in their learning contexts with limited resources, unlike many ESL students who are required to handle a large amount of readings with general comprehension. Laufer and Hill (2000) also found that the EFL learners in Hong Kong and Israel frequently consulted a computer assisted language learning (CALL) dictionary when they read a short text (120 words); they looked up each
of 12 target words between 1 and 3.2 times. In particular, Hong Kong students who were Asian learners of English like the participants of the present study looked up the words almost twice as often as the Israeli learners.

Secondly, the differences between the present study and previous studies in the rates of use of LPS options may be partially explained by the types of dictionaries used. Whereas all subjects in the previous studies (Fraser, 1999a; Paribakht & Wesche, 1999) used a PD, half of the subjects in the present study used an ED. Studies have shown that students frequently consult a computer-based ED or a handheld ED during a reading task, suggesting that the ease of searching facilitates dictionary consultation (e.g., Knight, 1994; Laufer & Hill, 2000). As discussed below in detail, the present study found that the ED users had a higher mean score for the frequency of dictionary use than the PD users, although no significant differences were found. The ED users may have partially contributed to the increase in the percentage of consulting, which in turn led to the decrease in the percentages of inferring and ignoring.

An explanation for the differences between the findings of the present study and those of Fraser’s (1999a) study may be the length of the text used. The text used in the present study (517 words) was much shorter than those used in Fraser’s study (1000-1,200 words). Some other studies on dictionary use also show that students less frequently consult a dictionary when they read a longer text (e.g., Hulstijn, 1993, Hulstijn et al., 1996).

The differences between the findings of the present study and those of Paribakht and Wesche’s (1999) study could be partially due to the differences in the assigned task. In the present study, the students were asked to verbalize what they were thinking during
the task after reading the text, whereas in Paribakht and Wesche’s study, the students were asked to verbalize their thoughts during and after reading the text. The heavy task load of the concurrent think-aloud procedure in their experiment may have prevented the students from reading the text using a dictionary, as they would have done in normal contexts. This may explain the unusually rare occurrences of dictionary consultation in their study.

This study found that the mean success rate of determining the meanings of unknown words (i.e., the percentage of the words for which the meanings were determined successfully and/or partially successfully out of the number of words for which the meanings were sought via consulting and/or inferring) was high when the students consulted and/or inferred, although there was a wide variability. The students successfully consulted 80% of the time, and successfully/partially successfully 85% of the time. Forty-three percent of inferring was successful, and 79% of inferring was successful/partially successful. The students successfully consulted after inferring 79% of the time, and successfully/partially successfully consulted after inferring 84% of the time.

Using a similar research design, Fraser (1999a, 1999b) also found high success rates in determining word meanings when the students consulted or inferred. Seventy-six percent of consulting alone resulted in full comprehension and another 5% resulted in partial comprehension, and 52% of inferring resulted in full comprehension and another 20% of inferring resulted in partial comprehension. When the students consulted after inferring, they attained full comprehension 83% of the time and partial comprehension 7% of the time. Since Fraser incorporated training of LPS use into her study, the high success rate may be partially explained by the effects of the training.
Some previous studies have focused on inferring and have found a wide range of success rates (Huckin & Bloch, 1993; Frantzen, 2003; Haynes & Baker, 1993; Nassaji, 2003; Parry, 1993). For example, Parry (1993) asked a Japanese student, Yuko, to record new or difficult words that she encountered in her anthropology textbook during a semester and gloss what she guessed their meanings to be. She was able to gloss 148 words out of 168 words (88%), and of the 148 glosses, 55 (37%) were judged to be correct and 60 (41%) were judged to be partially correct. Parry attributes a high success rate of inferring to her knowledge and experience as an adult and the richness of context in which the vocabulary was encountered throughout her academic course.

In contrast, other studies on inferring have found that L2 learners were not very successful at inferring word meanings from context. Nassaji (2003) asked 21 adult ESL students to infer the meanings of 10 target words from context and found that of the total 199 inferences, 51 (25.6%) were successful, 37 (18.6%) were partially successful (18.6%), and 111 (55.8%) were unsuccessful. Similarly, Huckin and Bloch (1993) found that the Chinese ESL students made only 25 successful (or partially successful) guesses (57%) out of 44 unknown words that they came across in two short passages. Similarly, Frantzen (2003) found that the students were only able to infer correctly 7 (28%) of the 25 Spanish target words appearing in a short story.

In association with Fraser’s study (1999a), the present study appears to indicate that students are more successful at determining word meanings when they consult a dictionary than when they only infer. In particular, students appear to be more successful at attaining full comprehension of word meanings when they consult a dictionary. Moreover, the comparison of these studies with previous studies on inferring indicates
that students also infer word meanings more successfully when they have access to a dictionary. The previous studies on inferring, most of which did not provide participants with access to a dictionary, found low success rates, except for Parry’s (1993) study. Parry’s study differs from other studies in that the student inferred word meanings in the broad context where vocabulary was encountered in her anthropology course throughout the quarter, and that she was also allowed to consult a dictionary afterwards. Students may be more successful at inferring word meanings with access to a dictionary because dictionary use decreases the density of unknown words in the surrounding text and aids in inferring word meanings from context.

Another possible reason for high success rates found in the present study is the topic of the text used (i.e., avian flu). Since this topic elicited major public attention at the time of the study, many of the students may have been already familiar with it, which helped them determine contextual meanings of words when consulting or inferring.

Another possible reason is that many of the students identified the words that they already knew but were not completely sure to be unfamiliar or difficult ones, as qualitative analyses showed. When the students “inferred” meanings of these words, they actually recalled the meanings that they already knew. Likewise, when they used a dictionary for these words, they only confirmed what they had already known.

This study found that the success rate of determining word meanings was not higher when the students consulted after inferring than when they consulted alone, which is inconsistent with the finding of previous studies. These previous studies indicate that forming a hypothesis about word meanings before consulting a dictionary help students choose the contextual meaning from all the listed meanings (Fraser, 1999a; Naubach &
The students of the present study may have formed an inappropriate hypothesis about some words, which may have prevented them from attending to dictionary information properly or carefully. The strategy of consulting after inferring may not always be as helpful as previous studies suggest.

This study indicated that the students may have incidentally learned a large portion of words from reading the text. Overall, the students showed high retention rates on the vocabulary tests administered a week after the reading session; namely, they selected correct answers for 3.55 words (71%) of 5 target words on the multiple-choice vocabulary test, successfully recalled meanings for 55% of all unknown words, and successfully/partially successfully recalled meanings for 64% of all unknown words on the open-ended test.

Previous studies on incidental vocabulary acquisition while reading (Chun & Plass, 1996; Fraser, 1999a; Hustijn, 1992; Hulstijn et al., 1996; Knight, 1994; Krashen, 1989; Paribakht & Wesche, 1997) have reported a wide range of retention rates, because their designs varied. However, most of these studies reported considerably lower retention rates than those found in this study (71% on the multiple-choice vocabulary test, 55% and 64% on the open-ended test). For example, when there was no access to a dictionary, Krashen (1989) reported retention rates of 7%, and Hulstijn (1992) reported retention rates of 16% (when four alternatives for each word were given in the margin of the text) and 7% (when synonyms were given in the margin).

When there was access to a dictionary or a gloss, rates of retention appear to increase slightly. For example, Fraser (1999a) found an overall retention rate of 28% on the vocabulary tests administered a week after the reading sessions.
participants only consulted or inferred, they recalled word meanings about 30% of the time. When they inferred and then consulted, they had a mean retention rate of 50%. Similarly, Hulstijn et al. (1996) found that 25% of the target words were remembered in the marginal gloss group and 2.5% in the dictionary group when they appeared in the text once, whereas 35% of the target words were remembered in the marginal gloss group and 15% in the dictionary group when the word appeared in the text three times. With access to an ED, Knight (1994) reported a retention rate of 20% on the immediate definition-supply test and 61% on the immediate select-definition test, and a retention rate of 14% on the delayed definition-supply test and 51% on the delayed select-definition test; whereas Chun and Plass (1996) found that 26% of target words were retained on the definition-supply test and 77% on the recognition test.

Laufer and Hill (2000) found a higher retention rate than other studies, which is comparable to this study, although they administered the vocabulary test immediately after the reading session. The Israeli students recalled the meanings for 33.3% of the 12 target words, and the Hong Kong students recalled 62% of them. As discussed earlier, Laufer and Hill’s participants, particularly the Hong Kong group, depended heavily on a dictionary, as those in the present study did. Students may retain more words when they actively deal with the words by consulting a dictionary. This may be particularly true when students are as successful at retrieving an appropriate meaning from a dictionary as those in the present study.

As Fraser (1999a), who conducted a similar study, discusses, two factors of the research design also partially contributed to the high retention rates found by the present study. Although the success rates found in Fraser’s study were not as high as those found
in the present study, they were still much higher compared with those reported by other similar studies (e.g., Hulstijn et al., 1996), because of these factors. First, since the students identified the tested words to be unfamiliar, these unknown words included only those noticed and salient for the students. Secondly, the retrospective think-aloud interview may have created an additional word-learning opportunity.

This study found no significant differences between the two dictionary groups for any of the rates of use of LPS options and the success rates of determining word meanings. However, the ED group had a higher mean score for the rate of consulting than the PD group (.7699 and .6075), whereas the PD group had a higher mean score for the rate of guessing than the ED group (.5842 and .4568). In particular, the four low-scoring ED users inferred less than 30% of unknown or difficult words. Also, the qualitative analyses found that the PD users and the ED users differed in the processing of words before consulting; the PD users appeared to take more time or effort to guess or remember words before consulting a dictionary.

Furthermore, no significant differences were found between two dictionary groups for the scores on any of the posttests (the comprehension test, the multiple-choice vocabulary test, the rate of correct answers for the open-ended vocabulary test, and the rate of correct/partially correct answers for the open-ended vocabulary test). When looking at individual scores, however, the three low-scoring ED users who had rates of guessing (.23, .16, and .26) also had very low comprehension test scores (0, 1.0, and 2.5).

Previous studies have revealed complicated pictures about relative effects of EDs versus PDs on students’ dictionary use (Koyama & Takeuchi, 2003, 2004; Iso & Osaki, 2004; Osaki et al., 2003), reading comprehension (Koga, 1995; Iso & Osaki, 2004; Osaki
et al., 2003), and vocabulary learning (Koyama & Takeuchi, 2003, 2004; Iso & Osaki, 2004; Osaki et al., 2003). For example, using a computer-based ED, Koga (1995) found that the students needed less time for dictionary consultation and read faster in the ED condition than in the PD condition. Also, the high-reading-ability group improved reading scores in the ED condition, although no differences were found in the low-reading-ability group, possibly due to the floor effects. Other researchers focused on the impact of handheld EDs on L2 learning. Koyama and Takeuchi (2003) found no differences between the ED and PD groups in respect to either the number of words searched and search time, although the high-school ED users tended to look up more words. There were no significant differences in the rate of recall or the rate of recognition on the vocabulary tests given a week after the reading session. Similarly, Koyama and Takeuchi (2004) found no significant differences between the ED and PD groups in search time or the quantity of retrieved information. No differences were found between the ED and PD groups in the rate of recall, although the PD group scored higher than the ED group in the rate of recognition. Osaki et al. (2003) found that the ED groups outperformed the PD groups in the definition test and the reading comprehension test, although no differences were found between these two groups in the vocabulary tests administered immediately and two weeks after the reading session. Partially replicating this study with an easier text and easier tests, Iso and Osaki (2004) found no differences between the two dictionary groups in the definition test, the reading comprehension test, and the vocabulary test given after the reading session.

Overall, these studies seem to indicate that EDs do not significantly influence students’ dictionary use, reading comprehension, or vocabulary learning. However, when
students read a challenging text, due to its difficulty (e.g., Iso & Osaki, 2004; Koga, 1995) or students’ low proficiency (e.g., Koyama & Takeuchi, 2003), EDs may have both negative and positive effects. These findings corroborate those of the present study. Although significant differences were not found between the two dictionary groups, the ease of searching may have caused some low-proficiency ED users to depend heavily on an ED, possibly at the expense of interaction with the textual context, as shown in their low rates of guessing. This might in turn have negatively affected their reading comprehension.

Another difference between the ED and PD users found in the present study is that the ED users tended to consult a dictionary more often and inferred less often than PD users, although mean differences were not significant. Moreover, they tended to take less time or effort to remember or infer the meaning of a word before consulting a dictionary. Koyama and Takeuchi (2004) found that the PD group scored higher than the ED group in the rate of recognition, which identifies a small degree of word learning, and they explain this by “elaborative work in the process of searching” in the PD condition. This may hold true for this study. Since the PD group appeared to process words more deeply than the ED group, if the researcher administered a recognition test, there might have been significant differences between the two dictionary groups.

The present study found that the large-vocabulary group had a significantly higher mean score for the rate of successful/partially successful guessing than the small-vocabulary group. Furthermore, the large-vocabulary group had a higher mean score for the rate of guessing than the small-vocabulary-group, and the small-vocabulary group had
a higher mean score for the rate of consulting than the large-vocabulary group, although these differences were not statistically significant.

Furthermore, the high-reading-ability group had a significantly higher mean score for the rate of successful consulting, the rate of successful/partially successful consulting, the rate of successful/partially successful guessing, and the rate of successful combined LPS use than the low-reading-ability group, although the mean difference for the rate of successful combined LPS use was rather questionable.

Overall, the high- and low-proficiency students differed in the success rates of determining word meanings rather than in the rates of use of LPS options. The differences between the high- and the low-proficiency students in their LPS use, revealed by qualitative analyses, appear to explain why the high-proficiency students were more successful at determining word meanings when consulting or inferring than the low-proficiency students. A major finding of qualitative analyses was that the high- and low-proficiency students differed in the use of contexts. High-proficiency students skillfully used wider and immediate contexts when consulting or inferring. On the other hand, low-proficiency students were unable to use global cues successfully and depended on local cues, particularly on word structures or shapes. Another difference between high- and low-proficiency students was that high-proficiency students used a dictionary more selectively than low-proficiency students; high-proficiency students consulted a dictionary only for important words. Also, some high-proficiency students paid attention to a wider variety of information when consulting a dictionary than most low-proficiency students. Finally, some low-proficiency students demonstrated a lack of syntactic or morphological knowledge.
These patterns of LPS use for high- and low-proficiency students coincide with those identified as useful or not useful by previous studies. Many studies (i.e., Huckin & Bloch, 1993; Frantzen, 2003; Haynes & Baker, 1993; Nassaji, 2003) have found that guessing word meanings by drawing on word shapes without carefully checking them against context is a major cause of incorrect guesses. Some studies (i.e., Admson, 1990; Hosenfeld, 1977) have found that low-proficiency students use a dictionary too often without making strategic choices about when to use a dictionary. Additionally, some studies have found that high-proficiency students attend to a broader range of information in a dictionary than low-proficiency students (e.g., Fan, 2000). Finally, some studies have pointed to a lack of grammatical knowledge as the cause of some wrong guesses (e.g., Frantzen, 2003; Parry, 1993). These differences in LPS use found between the high- and low-proficiency students in the present study seemed to result in the differences in the success rates of determining word meanings between them.

The large-vocabulary group had a higher mean score for the rate of guessing than the small-vocabulary group, and the small-vocabulary group had a higher mean score for the rate of consulting than the large-vocabulary group, although these differences were not statistically significant. This can be explained by the density of unknown words in the text. Studies have found that the portion of unknown words out of total words significantly affects the success of guessing (Laufer, 1992; Nation, 2001). For example, Nation (2001) notes that 95% coverage is needed for learners to be able to use the cues for guessing unknown words. In this study, the percentages of unknown words out of total words in the text ranged from 2% to 10%, although the students had access to a dictionary. Many high-proficiency students, who were above the threshold of 95%
coverage, may have been able to infer word meanings without drawing on a dictionary too much; however, for some of the low-proficiency students, who were below the threshold, it may have been necessary to use a dictionary because they were unable to infer words meanings due to the high densities of unknown words.

The qualitative analyses revealed the overall patterns of the students’ LPS use regardless of dictionary group or proficiency group. First, many of the students depended on a dictionary, which agrees with the high rate of consulting found by quantitative analysis; some of them even consulted a dictionary to confirm word meanings that they already knew. Moreover, many students were concerned about translating words into proper Japanese. Likewise, Gu (2003) found that the two successful Chinese learners of English who participated in his study read the text in an intensive manner, paying attention to individual words, although they also displayed some differences in learning style. Gu explains this finding by the combination of the Chinese conception of learning, traditional schooling and literacy practices in China, the prevailing methods for teaching and learning English in China, the demands of the English learning task, and individual learning styles. Some of these explanations may be applicable to the present study. The students’ dependence on a dictionary, as well as their concerns about translation, seems to be due to the grammar-translation method in which they had been taught reading skills. Also, these patterns may be related to general schooling and/or literacy practices in Japan, which emphasize analytic rather than holistic learning styles. Furthermore, the students’ concerns about translation may be partially because the researcher asked the students to answer comprehension questions in Japanese.
Although many students frequently consulted a dictionary, some had difficulty with dictionary consultation, particularly with looking up compounds, understanding Japanese definitions, and figuring out the part of speech of unknown words beforehand. Among these problems, the most frequent and serious problem seemed to arise when students looked up compounds such as *fearmonger* and *level-headed*. Some students even completely gave up looking up these words in the dictionary. Some previous studies also have recognized this problem. For example, Béjoint (1981) showed that the French students found it difficult to retrieve English compounds from the dictionary, possibly due to the influence of their mother tongue.

Although many students depended on a dictionary, they also frequently guessed word meanings. They often inferred words meanings by drawing on local cues such as word structures/shapes, sentence structures/surrounding words, and Japanese loanwords. Some of the students’ guesses also were influenced by past experiences. Other studies also have identified similar patterns when learners guess word meanings. Many studies (e.g., Chern, 1993; Haynes, 1993; Huckin & Bloch, 1993) have shown that learners use the immediate context more frequently as well as more successfully than the wider context when they infer word meanings, and that they also frequently use graphemic/morphemic cues. Some studies (e.g., Parry, 1991, 1993) have shown that students’ idiosyncratic guesses about words occasionally reflect previous encounters with them in different contexts.

Many students came up with only the vague meanings or images of words. In some cases, the vague understanding of words appeared to be enough to comprehend the text. Furthermore, this vague understanding might have been an important first stage of
vocabulary acquisition. As Schmitt (2000) notes, vocabulary acquisition is an incremental process, where various dimensions of word knowledge are gradually learned though multiple encounters in different contexts. A more precise understanding of the meanings of the words might have built upon the vague understanding through subsequent encounters in different contexts.

This section has discussed the main findings from the retrospective think-aloud protocols collected during the reading session in addition to the reading test administered during the reading session and the vocabulary tests administered after the session, by comparing them with those of the previous studies. Overall, the students of this study looked up unknown words more frequently and ignored them less frequently than those of most previous studies. They were generally as successful or more successful at consulting or inferring than those of previous studies. Moreover, they had a higher retention rate than the findings of previous studies. The ED and PD groups did not show any differences in any of the rates of use of LPS options and any of the success rates of determining word meanings, results which coincide with those of previous studies. In contrast, the high- and low-proficiency students differed in some of the success rates of determining word meanings. The differences in the success rates between the two proficiency groups can be explained by the differences in LPS use identified in the qualitative analyses, which correspond with those identified in previous studies.

**Interview Results**

This section presents the results from the interview data, which were analyzed qualitatively, followed by a discussion of the results in comparison with other studies.
Data Analysis

The results from interview data are presented with a focus on the differences between ED and PD users and the differences between high-proficiency and low-proficiency students. Next, this section reports other recurring patterns, showing the general patterns of students’ LPS use regardless of dictionary and proficiency groups, or the differences among students that can be explained by other characteristics than dictionary type or proficiency.

Differences between ED and PD users. One of the main differences between ED and PD users was how they chose their dictionary or dictionaries. All PD users, except for one, bought their dictionaries because they were recommended or required at their regular school or review school, called a juku or a yobiko. Most of the PD users bought their PDs when they entered high school. Therefore, they had been using them for more than a few years and were accustomed to using them. They used PDs such as Genius, Luminous, Super Anchor, Grand Century, Sunrise, Lighthouse, and Fresh Genius. Among them, dictionaries such as Super Anchor, Grand Century, Sunrise, Lighthouse, and Fresh Genius are those written specifically for intermediate students. Although these dictionaries are easy to read with colors and large fonts, they have a limited number of headwords and alternative senses. Six PD users had these dictionaries.

As many other PD users did, S. F. bought his English-Japanese (Genius) and Japanese-English (Genius) dictionaries because he was required to buy them when entering high school:

51. C. K. When did you buy your English-Japanese and Japanese-English dictionaries?
   S. F. I bought them when I entered high school.
C. K. Why did you choose your dictionaries?
S. F. I was required to buy them with other textbooks at school.

On the other hand, many ED users chose their EDs according to their needs or preferences such as the availability of certain (types of) dictionaries, the ease of use, and the availability of certain functions. The most popular brand of their EDs was Casio. Eight ED users had a Casio. All students had an English-Japanese dictionary or dictionaries, a Japanese-English dictionary, a thesaurus, a Japanese dictionary, and a Chinese character dictionary in their EDs. The most popular English-Japanese dictionary contained in their EDs was a Genius; all students had a Genius in their EDs. Additionally, some students had dictionaries and other resources, such as an English monolingual dictionary or dictionaries, an English usage dictionary, a classical Japanese dictionary, a dictionary of another foreign language, and Test of English for International Communication (TOEIC) practice tests.

Most ED users bought their EDs relatively recently—when they were in the 2nd or 3rd year of high school or when they entered college—as an addition to their PDs. Therefore, ED users were not as accustomed to using their EDs compared with PD users. Although many ED users were skilled in using their EDs, some students still did not make the most of them.

An ED user, Y. A., bought her ED when she was in the 2nd year of high school. She chose it because it was easy to use:

52. C. K. When did you buy your ED?
Y. A. I bought it when I was in the 2nd year of high school.
C. K. Why did you choose your ED?
Y. A. I chose it because I found it easy to use when I borrowed it from someone.
   It is easy to type.
C. K. Your ED is on a stand. Is that why it is easy to use?
Y. A. Yes, it is. I can change the angle because the stand slides.

Similarly, another ED user, M. T., bought her ED in the previous year. She chose it due to its features, such as the availability of multiple dictionaries (32 dictionaries), a clear screen, and the capability of adding other dictionaries by inserting cards:

53. C. K. When did you buy your ED?
    T. M. I bought it last November.
    C. K. Why did you choose it?
    T. M. It contains many dictionaries and has a clear screen. Also, I can add other dictionaries to it by inserting cards. We study a second foreign language at college. I had not decided which language I would study at that time. So I chose this ED so that I could add a dictionary of whatever language I would choose.

Although he could use general functions in his ED, N. S. (male), who had bought his ED six months before, still could not use some functions:

54. C. K. Do you understand the functions of your ED?
    N. S. Mostly. There are many special functions. Although I cannot use all of them, I can use the general ones.

Overall, despite some problems, both ED and PD users were satisfied with their own dictionaries—although for different reasons. Many PD users were satisfied with their PDs because they are easy to read or easy to use. Their PDs are colored, have large fonts, and contain illustrations. In particular, dictionaries such as Super Anchor and Grand Century highlight important senses with colors. Some PD users took advantage of this feature and looked at highlighted senses when they looked up a word in the dictionary. This appeared to help them choose the contextual meaning from those listed in the dictionary by limiting their searches. For example, H. O. looked at all highlighted senses in her PD (Grand Century) before choosing the contextual meaning:

55. C. K. Do you usually look at all meanings listed in the dictionary?
    H. O. Yes, I do.
C. K. Do you look at all meanings for the words that have many meanings such as state?
H. O. I look at all boldfaced meanings and choose among them.

Furthermore, many PD users thought that their PDs contained sufficient information, including examples, idioms, headwords, senses, and grammatical and usage information. Particularly, some PD users felt that a PD contains better information than an ED. For example, S. N. was satisfied with her PD because it contains a good deal of usage information, examples, and illustrations:

56. C. K. Why are you satisfied with your PD?
   S. N. I like my PD [Genius] because it is rich in usage information and examples.
   C. K. Do you often look at examples?
   S. N. Yes, I do when I have time. Also, I like my PD because it contains illustrations. EDs do not contain them.

   Similarly, Y. F. found usage notes in her PD helpful. She explained how she used them to enhance her vocabulary:

57. C. K. [looking at her responses on the questionnaire] Could you explain how you use your dictionary to enhance your vocabulary?
   Y. F. I use usage notes that show how the word is used in conversation. I try to use my PD rather than other sources because of the usage notes.

   Some PD users liked their PDs because they can mark them. They used their PDs to enhance their vocabularies by marking them. For example, H. K. marked her dictionary for new information concerning pronunciation, grammar, and meanings. She was taught this strategy in high school:

58. C. K. When do you mark your dictionary?
   H. K. I mark my dictionary when I find new information, such as meanings, grammatical information, and pronunciation that I did not know or expect.
   C. K. Do you mark only the contextual meaning or other meanings as well?
   H. K. I mark only the contextual meaning, but I also mark other meanings if they are unfamiliar, when I have time.
   C. K. Why do you mark your dictionary?
H. K. My teacher told us to mark a dictionary because we would notice the marked information when we look up the word again. I found this strategy useful, so I continue to do so.

Likewise, Y. F. preferred to use her PD because she could figure out how many times she had looked up a word by marking her PD:

59. C. K. Why do you prefer to use a PD?
Y. F. I prefer to use my PD because I can mark it. I mark a word every time I look it up. But I cannot write in an ED.
C. K. Why do you mark a word?
Y. F. To know how many times I have looked it up.

Although all PD users were satisfied or somewhat satisfied with their PDs, some of them found them too heavy to carry around. For example, S. S. thought that her PD was so heavy that she did not often bring it to school:

60. C. K. Do you usually bring your PD to school?
S. S. I bring it when I think that I will need it in class, but I don’t do that very often because it is heavy.

Others, in particular, those who used a dictionary written for intermediate students, thought that their PDs did not contain enough headwords and senses. In such occasions, they had to borrow another dictionary from others or ask others. For example, Y. K. had to borrow an ED from her sister when she could not find a word in her PD (Super Anchor):

61. C. K. Are you satisfied with your PD?
K. Y. I was satisfied with my PD when I was in high school. But I recently noticed that it does not contain enough headwords. For example, I did not find words such as caveat and emptor today [that appeared in the text used during the practice session].
C. K. What do you do when you do not find a word in your dictionary?
K. Y. I borrow my sister’s dictionary. She has an ED, so I borrow it from her.
Moreover, some of the PD users were not confident about their search speeds, especially when they compared themselves with ED users. For example, H.K. was not confident about her dictionary skills because she could not look up words quickly:

62. C. K. Why were you not confident about your dictionary skills?
    H. K. I cannot look up words quickly. I can use a dictionary effectively if I do it slowly, but the speed is slow compared with ED users.

Although they were satisfied with their PDs, most PD users wished to buy an ED if they could afford or had a chance to do so. However, many of them stated that they wished to buy one mainly due to its portability. Some of the PD users also wished to buy an ED because of the availability of multiple dictionaries. They stated that they would continue to use a PD at home, although they would carry an ED to school. A few did not wish to buy an ED. For example, T. T. wished to buy an ED only due to its portability:

63. C. K. Do you wish to buy an ED?
    T. T. I do not wish to buy an ED because of its contents or speed, but I wish to buy one only because of its portability. If I had both a PD and an ED at home, I would use a PD. [With an ED], I have to tap into another screen to look at examples. Also, I cannot look at a whole entry at one time. I have to scroll to look at different meanings.

C. K. Is it troublesome to scroll?
    T. T. It is hard to compare different meanings and choose the meaning that is appropriate for the context.

Similarly, S. F. wished to have an ED because of its portability and the availability of a Japanese dictionary or a Chinese dictionary, although he would use a PD at home:

64. C. K. If someone gave you an ED, would you take and use it?
    S. F. Yes, I would, because an ED could contain a Japanese dictionary or a Chinese dictionary.
    C. K. Would you rather use an ED or a PD?
    S. F. I would use an ED because it is light. I can use it at school.
    C. K. How about at home?
    S. F. I would use a PD because I got used to it.
Although they did not appear to perceive it as a limitation, many PD users were limited in the types of dictionaries that they had or used. Nine PD users did not have or use a monolingual English dictionary. Moreover, four PD users did not have a full version of a Japanese-English dictionary. They had no Japanese-English dictionary, had a concise Japanese-English dictionary, or a Japanese-English dictionary attached to an English-Japanese dictionary as an appendix. For example, Y. Y. used a Japanese-English dictionary attached to an English-Japanese dictionary. He found an English word in the Japanese-English dictionary and looked it up again in the English-Japanese dictionary when he engaged in writing:

65. C. K. What do you do when you cannot come up with the word that describes your idea?
Y. Y. I use a Japanese-English dictionary to find out the word and then look it up again in an English-Japanese dictionary.
C. K. Why do you look it up again in the English-Japanese dictionary?
Y. Y. I don’t have a Japanese-English dictionary. I use the Japanese-English dictionary attached to the English-Japanese dictionary, so I have to look it up again in the English-Japanese dictionary.
C. K. Do you look at examples and usage information in the English-Japanese dictionary because the Japanese-English dictionary does not contain such information?
Y. Y. Yes, I do.

Two PD users stated that they used an ED and a PD at the same frequency. They used an ED because it is easy to carry, but used a PD at home. For example, M. S. used her PD at home to enhance her vocabulary because she thought it helped with the retention of words:

66. C. K. What do you do to enhance your vocabulary?
M. S. I use an ED at school but use a PD at home because I think it is better to look up a word laboriously.
C. K. Do you think that it facilitates retention?
M. S. Yes, I do.
Whereas PD users were overall satisfied with their PDs, ED users were also satisfied with their EDs—but for different reasons. Most ED users were satisfied with their EDs due to their search speeds and portability (or lightness). Many ED users were satisfied with their EDs so highly that they tended to use them exclusively once they got them. For example, Y. M. bought an ED because of its lightness and quickness of searching compared with a PD:

67. C. K. Why did you choose your ED?  
    Y. M. I chose an ED because it is lighter, and it is quicker to look up a word in an ED than in a PD.

Likewise, Y. N. stated that she primarily used her ED because of its search speed:

68. C. K. Do you have a PD besides an ED?  
    Y. N. I do, but I do not use it at all.  
    C. K. Do you mainly use an ED?  
    Y. N. Yes, I do.  
    C. K. Why don’t you use a PD?  
    Y. N. I don’t use it because it is time-consuming to look up a word in a PD.

R. O. depended on her ED due to its search speed. She thinks that her ED facilitated dictionary consultation because of its search speed:

69. C. K. Why do you use an ED more frequently than a PD?  
    R. O. It is time-consuming to look up a word in a PD. I often left unknown words as they were without looking up when I was using a PD, but I have looked them up immediately since buying an ED.

However, a few ED users were not confident about their search speeds. For example, J. S., who recently bought her ED, was not confident about her dictionary skills because she cannot look up a word quickly either in an ED or a PD. This might be because she had not been accustomed to using an ED:

70. C. K. Are you confident about your dictionary skills?  
    J. S. It sometimes takes time to look up a word in a PD.  
    C. K. Can you look up a word quickly in an ED?
J. S. Yes, I can [look up a word more quickly], but it still takes time to look up a word because I cannot find an appropriate meaning quickly.

Some ED users were satisfied with their EDs because of the availability of their various functions and resources, such as a jump function, an idiom search function, an example search function, a recording function, practice tests, and reference materials.

Many ED users found a jump function useful. For example, K. Y. found it helpful to jump from an English-Japanese dictionary to a Japanese dictionary:

71. C. K. Why are you satisfied with your ED?
    K. Y. I can look up a word quickly. Also, I can look up a word that I don’t understand in the definition.
    C. K. When I look up a word in the English-Japanese dictionary, I find definitions written in Japanese. If I don’t know a certain expression in the definitions, I can jump to an entry for the expression in the Japanese dictionary without closing the entry in the English-Japanese dictionary.

Likewise, Y. H. found a jump function useful because she could jump from an English-Japanese dictionary to another English-Japanese dictionary:

72. C. K. Why are you satisfied with your ED?
    Y. H. A PD [as opposed to an ED] is heavy and bulky. Also, I think that it is amazing to change from Genius to Readers when the definition in Genius does not help.

Some ED users took advantage of an idiom search function. K. Y. found it convenient to see a list of idioms by using this function:

73. C. K. What other functions [than a jump function] do you find helpful?
    K. Y. I think that it is convenient to get a list of idioms.
    C. K. Can you look up idioms separately?
    K. Y. [showing how to use this function] When I push this key, I can move from the regular display to the list of idioms with examples like this.

A PD user (in my definition), M. S., who usually used a PD at home and an ED at school, explained why looking up idioms by using an idiom function is helpful compared with looking up idioms in a PD:
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74.  M. S.  A PD lists idioms at the end of entries but sometimes disperses them as examples throughout the entry, so I have to scan the whole entry.
C. K.  Do you mean that it is hard to look up idioms in a PD?
M. S.  It is easier to look up idioms in an ED because it shows idioms together.
C. K.  Can you do idiom searches with your ED?
M. S.  When I type a word [or words], I can see a list of the idioms using it [or them]. By using this function, I can see a list of idioms in alphabetical order.

Similarly, some ED users took advantage of an example search function. Y. N.

75.  C. K.  Which function[s] do you find helpful?
Y. N.  I can look at examples although I also like a jump function.
C. K.  Can you look at a list of examples containing the word by pressing the key?
Y. N.  Yes, I can. Examples show up immediately.

Many ED users drew on various dictionaries and materials in addition to English dictionaries. For example, K. Y. found it convenient to use a Japanese dictionary when necessary, as Excerpt 21 shows. Many ED users took advantage of a monolingual English dictionary, although they did not use it regularly. Their EDs contain a monolingual English dictionary (or dictionaries) for L2 learners, such as a Longman or an Oxford, either of which is frequently recommended by scholars. For example, Y. N. used a monolingual English dictionary to understand nuances in meaning after she roughly understood a word by looking it up in the English-Japanese dictionary:

76.  C. K.  Do you use a monolingual dictionary?
Y. N.  I sometimes use it after I use an English-Japanese dictionary. I use it to understand nuances in meaning.
C. K.  Do you think that a monolingual dictionary is more useful to understand nuances in meaning?
Y. N.  Yes, I do.

Some ED users depended on a recording function. For example, N. S. (male) used a recording function to avoid looking up the same word repeatedly:
77. C. K. Which function[s] do you find the most helpful?
   N. S. I can look at the list of the words that I looked up.
   C. K. How do you use the function?
   N. S. Sometimes, I look up a word in the dictionary, think that I already know it, and do not take a note. When it appears again, I can go back to the entry right away, if I cannot remember it.

   Although they are overall satisfied with their EDs, some ED users wished to have more functions or resources in their EDs. T. H. wished to have more functions in her ED, although she was not sure exactly what functions:

78. C. K. Are you satisfied with your ED?
   T. H. I think that it has few functions.
   C. K. What functions do you wish to have in your ED?
   T. H. I don’t know what functions are available.
   C. K. Do you think that your ED has fewer functions than others’ EDs?
   T. H. Yes, I do.

   Some ED users felt that their EDs contained many headwords, senses, examples, and detailed grammatical and usage information. They felt that their EDs had the same or a larger amount of information than their PDs. For example, Y. M. felt that his ED contained the same amount of information as his PD:

79. C. K. Have you ever failed to find the information that you are looking for [with your PD]?
   Y. M. Yes, I sometimes do. Sometimes, I cannot find a word including a hyphen [a compound], but it does not happen frequently.
   C. K. Do you think that your ED contains fewer words?
   Y. M. It does not matter. Even when I used a PD, I could not find some words.

   However, some ED users felt that their EDs did not have enough headwords, senses, examples, and grammatical and usage information. They sometimes consulted a PD, when they could not find such information in their EDs. For example, M. N. felt that her ED contained fewer examples than the PD that she used at her juku (a review school), although it contained as many examples as her own PD:
C. K. Is there anything about your ED that you are not satisfied with?
M. N. Nothing particular.
C. K. [looking at the questionnaire] You checked “it contains few examples.”
M. N. It is true.
C. K. You also checked “it contains few headwords, and sometimes I cannot find the word that I am looking for.”
M. N. Really? It contains few examples.
C. K. Do you think that a PD contains more examples than an ED?
M. N. It depends on the PD. The PD that I used at my juku contains more examples.
C. K. Do you think that your PD contains the same amount of examples as your ED?
M. N. About the same.

Similarly, Y. A. felt that her PD contained more examples, grammatical information, and synonyms than her ED and used her PD for such information:

C. K. Do you also use your PD?
Y. A. If I am at home, I use a PD when I find my ED unhelpful.
C. K. Could you give me more explanation about when you use your PD?
Y. A. Since my PD contains more examples, detailed grammatical information, and synonyms, [I use it for such information].
C. K. Doesn’t your ED contain such information?
Y. A. Not as much as my PD.

Although she was not sure about it, R. O. felt that her PD contained more words and used it when she could not find the word that she was looking for in her ED:

C. K. [looking at her response on the questionnaire] You wrote that you use your PD and ED for different purposes. Could you explain when you use a PD?
R. O. I sometimes use a PD when I cannot figure out the meaning of a word, namely, when I cannot find it in my ED or guess at its meaning.
C. K. Do you think that your PD contains more words than your ED?
R. O. I feel that way.

Whether students felt an ED contained more information than a PD seemed to depend on the kinds of EDs and PDs that they used. Also, many of them seemed not to be completely sure about their impressions.
Some ED users were not satisfied with the small screens of their EDs because they could not look at an entire entry at one time. For example, M. T. found it troublesome to tap to a different screen to look at examples:

83. C. K. Is there anything [about your ED] that you are not satisfied with?
M. T. It is hard to find examples compared with a PD. You can look at a whole entry with a PD, but you have to go to a different screen for examples with an ED.

To summarize the differences between PD and ED users, they differed in why and when they bought their dictionary or dictionaries. Whereas most PD users chose the PDs recommended by teachers or schools, all ED users chose their EDs according to their needs or preferences. All PD users bought their PDs more than a few years ago. However, all ED users bought their EDs relatively recently, namely, less than two years ago. Both PD and ED users were satisfied with their dictionary or dictionaries, although most of them found some problems with them. ED and PD users were satisfied with their dictionaries for somewhat different reasons. PD users liked their PDs for reasons such as the ease of reading, and the quality or quantity of information. In contrast, ED users liked their EDs due to their portability, search speed, and the availability of multiple recourses. The perceived advantages and disadvantages of their dictionaries appeared to lead to some differences between ED and PD users in their dictionary use, such as the marking of information, the use of different types of dictionaries, and the use of various functions and features.

Differences between high- and low-proficiency students. Interestingly, not many clear differences emerged between high- and low-proficiency students. All students volunteered to participate in the interview and reading session. They might have been all
motivated learners of English who would have been eventually successful, although there were some differences in proficiency at that point. Another reason for the lack of clear differences might be that some low-proficiency students did not tell the researcher what they really did in the face-to-face interview.

Although they appeared to share more similarities than differences, high- and low-proficiency students differed in their use of some LPSs. One of the differences is whether they used different reading styles according to the purpose or the occasion for reading. Many high-proficiency students used a dictionary differently according to their purposes of reading. Many high-proficiency students looked up only the words that were necessary for comprehending a text or answering comprehension questions, and the words that they could not guess, when they were reading to comprehend the general idea of a text. However, they looked up all unknown words when preparing for their English classes because they were required to translate a text word by word. For example, Y. K. used a dictionary selectively in the reading session. However, she looked up all unknown words when preparing for her English classes. She explained this difference in reading style:

84. C. K. Do you use usually a dictionary as infrequently as you did in the reading session?
Y. K. It depends on the purpose of reading. I look up all unknown words when preparing for my English classes, in particular when I think that teachers will call on me. But I did not look up many unknown words [in the reading session] because I thought that I could answer comprehension questions without them.

Furthermore, some high-proficiency students changed the timing of dictionary consultation according to the occasion or the purpose. For example, in the reading session, N. S. (female) used a dictionary after reading the hole text. Outside the test
situation (perhaps such as when studying for her English classes), she also refrained the use of a dictionary until the second reading of the text when she had time, but she consulted a dictionary immediately when she did not have time:

85. C. K. Do you read a text without a dictionary for the first time and use a dictionary for the second time [as you did in the reading session]?
   N. S. Yes, I do.
   C. K. Do you usually do so?
   N. S. I look up an unknown word right away when I don’t have time, but I sometimes read the whole text when I have time.
   C. K. Do you mean that you read the whole text without a dictionary?
   N. S. Yes, I do.

On the other hand, many low-proficiency students appeared to use the same reading styles regardless of the reading purpose or the occasion. Some low-proficiency students appeared to look up only the words that were necessary for comprehending a text or answering comprehension questions, and those that they could not guess, regardless of the reading purpose or the occasion. Some low-proficiency students appeared to look up all unknown words whenever they read an English text. For example, S. S. appeared to use a dictionary selectively for the words that were important for comprehending a text whenever she read an English text:

86. C. K. Do you think that you use a dictionary frequently?
   S. S. No, I don’t.
   C. K. Don’t you look up all unknown words whenever you read an English text?
   S. S. No, I don’t.
   C. K. Are there words that you look up and those that you don’t?
   S. S. Yes, there are. I look up more words at the beginning and less words as I read.
   C. K. How do you decide which words you look up and which words you don’t look up?
   S. S. I look up important words such as verbs and don’t look up less important words.
   C. K. What do you do with the words that you don’t look up? Do you guess their meanings from context?
   S. S. I sometimes do and sometimes don’t.
C. K. Do you guess word meanings only if you can?
S. S. Yes, I do.
C. K. Do you confirm the guessed meanings in the dictionary?
S. S. I seldom do so.
C. K. Do you think that you don’t have to confirm the guessed meanings [because you already know them]?
S. S. That’s right.

In contrast, another low-proficiency student, J. S. looked up all unknown words regardless of the occasion:

87. C. K. Do you think that you use a dictionary frequently?
   J. S. Yes, I do.
   C. K. Do you usually look up all unknown words [as you did in the reading session]?
   J. S. Yes, I do.
   C. K. Do you usually look up a word right after it appears?
   J. S. Yes, I do.
   C. K. Do you guess word meanings from context? Didn’t you do so just now [in the reading session]?
   J. S. Only for some words.

The above excerpts also show that some low-proficiency students did not combine multiple LPSs frequently. Some students, like S. S., did not use a dictionary to confirm guessed meanings frequently. Other students, like J. S., did not guess the meaning of a word before looking it up frequently.

Most high-proficiency students were skilled in dictionary use. All high-proficiency students, except for one, reported that they understood both grammar codes and phonetic transcripts in their dictionary. Most of them learned these codes and transcripts mainly by actually using a dictionary rather than by reading explanatory notes or receiving instruction, as Y. N. did:

88. C. K. Do you understand grammar codes and phonetic transcripts in your dictionary?
   Y. N. Yes, I do.
   C. K. Do you understand phonetic transcripts?
Y. N.  I understand most of them, although I don’t understand some.
C. K.  Did you read explanatory notes?
Y. N.  No, I did not. I learned grammar codes and phonetic transcripts as I used my dictionary.

In contrast, many low-proficiency students were not very skilled in dictionary use.

Five low-proficiency students reported that they did not fully understand phonetic transcripts or grammar codes. In particular, four students reported that they did not understand phonetic transcripts. For example, H. O. did not appear to understand phonetic transcripts very well, although she understood grammar codes. Like Y. N. in the above excerpt, H. O. did not read explanatory notes in her dictionary:

89.  C. K.  Do you understand grammar codes in your dictionary?
   H. O.  Yes, I do.
   C. K.  How about phonetic transcripts?
   H. O.  Not very well.
   C. K.  Did you read explanatory notes?
   H. O.  No, I didn’t.

Some low-proficiency students found it difficult to choose the contextual meaning form those listed in the dictionary. For example, M. N. was not very confident about her dictionary skills because she did not always choose the contextual meaning successfully:

90.  C. K.  Are you confident about your dictionary skills?
   M. N.  No, I am not very confident.
   C. K.  Why are you not very confident?
   M. N.  I am not sure if the meaning that I choose is the correct one. I tend to make a subjective judgment. I am not sure if I choose the correct one from many meanings listed in the dictionary.
   C. K.  Do you find it difficult to choose the correct one from many meanings?
   M. N.  Yes, I do. Anyone can use a dictionary if they don’t have to choose.

Most high-proficiency students were independent learners. When they could not find the information that they were looking for in their dictionaries, they tried to figure it out on their own by using other resources, inferring, or modifying dictionary information.
For example, R. O. searched for the proper nouns that she could not find in her dictionary by using the Internet:

91. C. K. Have you failed to find the information that you are looking for in your dictionary?
    R. O. Yes, [I have failed to find] proper nouns.
    C. K. What do you do in such occasions?
    R. O. I search for them on the Internet, although it is troublesome.

Similarly, Y. H. guessed the meanings of the compounds that she could not find in her dictionary by dividing them into parts:

92. C. K. Have you failed to find the information that you are looking for in your dictionary?
    Y. H. [I have failed to find] compounds like the word that I just handled [i.e., fearmonger]. I divide them into parts and guess their meanings.

Moreover, many high-proficiency students decided on the words that they would like to remember or learn on their own, according to the words’ frequency, part of speech, perceived usefulness, and so forth. For example, R. O. tried to remember the common words, particularly the verbs, which she might encounter again:

93. C. K. Do you distinguish the words that you try to understand only for comprehending a text and those that you try to remember for later occasions?
    R. O. Yes, I do.
    C. K. What kind of words do you try to understand only for comprehending a text and what kind of words do you try to remember for later occasions?
    R. O. I try to understand technical words such as names of disease only for comprehending a text.
    C. K. Why do you so?
    R. O. They will seldom appear. If they do, they will appear with notations.
    C. K. Do you try to remember common words?
    R. O. Yes, I try to remember common words such as verbs.

In contrast, many low-proficiency students were less independent learners. They depended on others, such as teachers and classmates, when they did not find the
information that they were looking for in their dictionary. Y. F. asked her teacher or someone else when her dictionary did not help:

94. C. K. What do you do when you are not convinced with the information that you find in the dictionary?
Y. F. I ask my teacher or someone else.

Moreover, many low-proficiency students decided on the words that they would like to remember or learn based on their teachers’ instruction rather than on their own. J. S. tried to remember the words that her teacher said were important:

95. C. K. Do you distinguish the words that you try to understand only for comprehending a text and those that you try to remember for later occasions?
J. S. I try to remember important words.
C. K. What do you mean by “important words”? 
J. S. I try to remember the words that the teacher says are important in class.

Although not many clear differences were found between low-proficiency and high-proficiency students, they differed in the use of some LPSs. Many high-proficiency students were skilled in dictionary use, whereas many low-proficiency students were not very skilled. Also, many high-proficiency students changed their reading styles according to the reading purpose or the occasion, but many low-proficiency students used the same reading styles regardless of the purpose or the occasion. Furthermore, many high-proficiency students were independent in their learning, whereas many low-proficiency students depended on others, including teachers and classmates.

Overall, the three students who had high proficiency in reading and low proficiency in vocabulary appeared to fit the patterns of high-proficiency students, although not all of them exactly fit the patterns. Also, the three students who had low proficiency in reading and high proficiency in vocabulary generally appeared to fit the
patterns of high-proficiency students, despite some discrepancies. This might be because the six students were all successful learners in one way or another.

All six students exhibited the features of independent learners. When they could not find the information that they were looking for in their dictionaries, they tried to figure it out on their own by using other resources, modifying dictionary information, or inferring. Also, they decided on the words that they would remember or learn on their own. For example, Y. Y., who had low proficiency in reading and high proficiency in vocabulary, turned to a monolingual English dictionary when he could not find a word in his English-Japanese dictionary:

96. C. K. Have you failed to find the information that you were looking for in your dictionary?
   Y. Y. Yes, I have.
   C. K. When did you fail to find the information that you were looking for?
   Y. Y. I could not find some words with prefixes. Also, I could not find some technical words.
   C. K. What do you do in such occasions?
   Y. Y. I look them up in the monolingual dictionary. I usually find them there.

K. Y., who had high proficiency in reading and low proficiency in vocabulary, tried to learn the general words that she might use again:

97. C. K. Do you try to remember all unknown words or choose among them?
   K. Y. I choose among the new words appearing in a text. I don’t think that I have to remember some words such as technical words.
   C. K. Why do you think so?
   K. Y. I can look them up again when they reappear. I cannot remember all words, so I usually don’t try to remember the difficult words that I will not use myself.
   C. K. Do you mean that you try to remember the words that you might use again later?
   K. Y. Yes, I try to remember general words.

Four of the six students stated that they understood grammar codes and phonetic transcripts in their dictionaries. For example, Y. M., who had high proficiency in reading...
and low proficiency in vocabulary, stated that he could understand these codes and
transcripts for the most part:

98. C. K. Do you understand grammatical codes in your dictionary such as
“transitive” and “intransitive”?
Y. M. I think that “transitive” means that the word is used without a preposition
C. K. How about “countable” and “uncountable”?
Y. M. “Countable” means that I can use the word in a plural form like two
letters.
C. K. So do you understand grammatical codes?
Y. M. Yes, I generally do.
C. K. How about phonetic transcripts?
Y. M. I generally understand them, although I am not very confident.

Similarly, Y. A., who had low proficiency in reading and high proficiency in
vocabulary, appeared generally to understand grammar codes and phonetic transcripts in
her dictionary:

99. C. K. Do you understand grammar codes in your dictionary?
Y. A. Relatively.
C. K. Do you use them?
Y. A. Yes, I sometimes do.
Y. A. Do you understand phonetic transcripts?
Y. A. I look at them when I am not sure how to pronounce words, but
otherwise I do not use them very often.

Three of the six students changed their reading styles according to the purpose or
the occasion. M. S., who had high proficiency in reading and low proficiency in
vocabulary, looked up only the words that she thought were important for answering
comprehension questions in the reading session. However, she appeared to look up all the
words, unless she could figure them out as she read, when preparing for her English
classes:

100. C. K. What kind of words did you look up and not look up in the reading
session?
M. S. I looked up only the words that I thought were related to comprehension
questions. I did not look up other unknown words.
C. K.  Do you usually distinguish the words that you look up and those that you don’t look up when preparing for your English classes?
M. S.  I don’t look up the words that I could figure out later as I read a text. I look up the words that I could not figure out.

Likewise, S. T. appeared to look up only the words that he thought were important for comprehending the text in the reading session, although he appeared to look up all unknown words when preparing for his English classes:

101.  C. K.  Don’t you usually use a dictionary very often?
S. T.  I use a dictionary to figure out the overall meaning of a text.
C. K.  Do you consult a dictionary if it is necessary to comprehend a text?
S. T.  I look up a word if I do not figure the main idea of a text without it.
C. K.  Do you usually use a dictionary selectively even when preparing for your English classes?
S. T.  I look up all unknown and partially known words in such occasions.

In summary, the six students who had high-proficiency in either reading or vocabulary and low-proficiency in the other category appeared generally to fit the patterns of high-proficiency students. All six students were independent in their LPS use. Also, four of them were skilled in dictionary use. Furthermore, three of them appeared to change their reading styles according to the reading purpose or the occasion.

**Recurring themes.** All students had been taught reading skills or English essentially in the grammar-translation method for six years at junior high school and high school before entering college. Many of them also attended a juku or a yobiko after school and learned English there by and large in the same way. They studied English intensively before they entered college in order to pass entrance examinations. Some of them, who were not accepted by a university in their first year, further learned English at their juku or yobiko for one or more years after graduating high school. After entering college, they continued to be taught more or less in the grammar-translation method.
In their English classes, students had studied English with a focus on reading. They had done some writing, especially when preparing for entrance examinations. They had had fewer opportunities for oral activities. They had not had many chances to use English outside the classroom, except for preparing for their English classes. In particular, they had not had many experiences in face-to-face oral communication. However, they had been extensively exposed to American or British cultural artifacts such as movies and music.

This context where they had learned English appeared to influence significantly the use of LPSs and other vocabulary learning strategies by all the students as well as their perceptions about vocabulary learning and English learning in general. In particular, the grammar-translation method and entrance examinations appeared to have significant influences.

All students shared some similarities in their use of LPSs and other vocabulary learning strategies and their perceptions about vocabulary learning and English learning. However, some differences were found between PD and ED users, and between high- and low-proficiency students in their LPS use, as discussed in the previous sections. In addition, some differences emerged between English majors and non-English majors in terms of their perceptions about vocabulary learning and English learning in addition to their use of LPSs and other vocabulary learning strategies.

English majors and non-English majors differed in the reasons that they studied English. English majors studied English for many reasons. Some of them wished to use it in their future occupations. Some English majors studied English because they enjoyed studying it, wished to communicate with people in other countries, wished to study
abroad, among other reasons. In contrast, agriculture majors studied English for a more limited range of reasons. They studied English because they were required to take English courses, wished to read articles in their field, wished to communicate with people in other countries, and so forth. For example, an English major, Y. N., studied English to communicate with people in other countries and to use it in her future occupation:

102.  C. K.  Why do you study English?
     Y. N.  I study English as a tool for communicating people in other countries. I also wish to use English in my future occupation. I wish to work with people from other countries.

On the other hand, an agriculture major, M. T., studied English because she was required to take English courses and because she would need to read or write a paper in her field:

103.  C. K.  Why do you study English?
     M. T.  At first, I studied English because it is included in the curriculum, but I now study English because I will need English to read or write articles in agriculture. I think that I need to have a minimum command of English.

The purposes for studying English seemed to affect their understanding of vocabulary knowledge. For many English majors, vocabulary knowledge had a broader meaning than for non-English majors, although a few English majors had a limited understanding of vocabulary knowledge. For many English majors, knowing a word meant the ability to use it both receptively and productively, the ability to use it for actual written or oral communications, or remembering it after encountering it repeatedly. On the other hand, most agriculture majors had a limited understanding of word knowledge. For them, knowing a word meant knowing its meaning or Japanese equivalent, or having looked it up in the dictionary. For example, H. K., an English major, thought that the knowledge of a word included receptive and productive knowledge:
C. K. When you do think that you have mastered a word?
H. K. I think that I have mastered a word when I know its meaning, usage, and derivations after looking it up in a dictionary. I think that I have mastered a word if I can understand it in whatever text it appears and also can use it myself.

In contrast, an agriculture major, T. T., thought that the knowledge of a word meant the ability to understand it without a dictionary when reading a text:

C. K. When do you think that you have mastered a word?
T. T. I think that I have mastered a word when I understand it without a dictionary in reading.

All students did not have much confidence in their general vocabulary. In particular, many students, including English majors, did not have much confidence in their productive vocabulary perhaps because of few opportunities to use English productively. However, some students who had special experiences had some confidence in their productive vocabulary. These students had studied abroad, had attended a private English conversation school, or had received intensive instruction on writing at their juku. For example, S. S., did not have confidence either in general vocabulary or in productive vocabulary, although she was an English major:

C. K. Are you confident about your vocabulary?
S. S. No, I am not.
C. K. Are you confident about your productive vocabulary?
S. S. No, I am not.
C. K. Do you think that the gap between your receptive and productive vocabulary is larger or smaller compared with others?
S. S. I think that it is larger.

On the other hand, another English major, Y. F., had some confidence in her productive vocabulary, although she did not have confidence in her general vocabulary. She had stayed with a family in Australia for two weeks when she was in high school:
C. K. Are you confident about your vocabulary?
Y. F. Not very much, but I have some confidence because I could get across what I mean with one simple word. I would not have to use a thick vocabulary notebook.
C. K. Do you mean that you are confident about your ability to use it rather than your vocabulary size?
Y. F. Yes, I do.

Another English major, M. N., also had some confidence in her productive vocabulary compared with others because she had received intensive training in writing at her yobiko:

C. K. Do you think that the gap between your receptive and productive vocabulary is larger or smaller compared with others?
M. N. I think that it is smaller. I have some confidence in my productive vocabulary because I attended a yobiko one year after graduating high school. I studied very hard. My English teachers were tough and assigned us difficult tasks. As for English composition, we were asked to translate newspapers or poetry into English. As for reading, I was asked to translate English newspapers or books into Japanese, so I have some confidence in my reading ability, when I have time and a dictionary.

Regardless of their majors, many students wished to increase vocabulary that they could use in daily conversation or to talk about social issues. In addition to or based on this general vocabulary, some English majors wished to increase the vocabulary used in their future occupations, and many non-English majors wished to increase the vocabulary used in their field. For example, an English major, H. O., wished to increase the vocabulary used in daily conversation and business:

C. K. What kind of vocabulary do you wish to increase?
H. O. I wish to increase vocabulary used in daily life.
C. K. Since you wish to work using English in the future, do you wish to increase vocabulary used in business?
H. O. I wish to increase vocabulary used in daily life and then gradually that used in business.
An agriculture major, N. S. (female), also wished to increase vocabulary used in daily conversation, although she also wished to increase vocabulary used in her field:

110.  C. K.  What kind of vocabulary do you wish to increase?
N. S.  Vocabulary used in daily conversation and in my field.
C. K.  Why do you wish to increase vocabulary used in daily conversation?
N. S.  I cannot get across what I mean without basic oral skills.
C. K.  Do you wish not only to read or write articles in your field but also to communicate with people in other countries?
N. S.  I am more interested in using English for communication than for academics.

All students intensively acquired vocabulary mainly by using a commercial vocabulary notebook in order to prepare for entrance examinations. Most of these commercial vocabulary notebooks list words with meanings, pronunciation, and derivations, and example sentences. This experience appeared to help most of them greatly increase their vocabulary. For example, S. F. considered memorizing a commercial notebook the most effective way of increasing vocabulary:

111.  C. K.  What have you found the most effective to increase your vocabulary?
S. F.  Preparing for entrance examinations. I learned by rote Target. [a commercial vocabulary notebook].

Similarly, R. O. appeared to find preparing for entrance examinations helpful for vocabulary learning. She studied for entrance examinations by doing reading exercises and memorizing a commercial vocabulary notebook:

112.  C. K.  What have you done to increase your vocabulary?
R. O.  Preparing for entrance examinations.
C. K.  What did you do to prepare for entrance examinations?
R. O.  I did exercises and learned vocabulary.
C. K.  What kinds of exercises did you do?
R. O.  Reading exercises.
C. K.  How did you learn vocabulary?
R. O.  I used a vocabulary notebook called Duo.
The grammar-translation method in which students essentially had been taught reading skills or English seemed to result in students’ dependence on a bilingual dictionary as well as their emphasis on reading and translation. Many students depended on a dictionary, especially, an English-Japanese dictionary. All students used a bilingual dictionary most often, although some also used a monolingual dictionary and a Japanese-English dictionary. For examples, Y. N. primarily used an English-Japanese dictionary, although she also used a monolingual dictionary for nuances in meaning and a Japanese-English dictionary for writing:

113. C. K. Which dictionary do you use the most often among the dictionaries that you have when studying English?
   Y. N. I use an English-Japanese dictionary the most often.
   C. K. Do you use a Japanese-English dictionary for writing?
   Y. N. Yes, I do.
   C. K. Do you use a monolingual dictionary?
   Y. N. I sometimes use a monolingual dictionary for nuances in meaning after I roughly understand a word by consulting an English-Japanese dictionary.

Although there were some differences between ED and PD users and between high- and low-proficiency students in the frequency of dictionary use, many students depended on an English-Japanese dictionary, in particular, when preparing for their English classes. Many students, especially high-proficiency students, looked up all unknown words, when they preparing for English classes, partially because they were required to translate a whole text into Japanese. Even when they were able to guess the meanings of unknown words, they also looked them up to confirm the guessed meanings. Also, many students thought that translating a text while reading was essential for English learning. In particular, some students thought that English learning was more or less reading or translating a text into Japanese.
M. T. depended heavily on a dictionary. She looked up all unknown words, including those that she was able to guess, when preparing for her English classes. When doing reading exercises, she used a dictionary selectively for only the words that were related to comprehension questions. However, she looked up all unknown words after finishing exercises:

114. C. K. Do you usually read a text without using a dictionary for the first time and use a dictionary for the second time, as you just did [in the reading session]?
M. T. Yes, I do when I am reading to answer comprehension questions, but if I am required to read the whole text, I will look up all unknown words.
C. K. Do you look them up right away [when they appear]?
M. T. Yes, I do.
C. K. Then, do you usually look up all unknown words when preparing for your English classes and selectively consult a dictionary when doing reading exercises?
M. T. [Even when doing reading exercises], I look up all unknown words when I finish exercises and correct my answers.
C. K. How do you decide which words to look up when doing reading exercises?
M. T. I look up the words that are necessary to answer comprehension questions.
C. K. What do you do with the words that you don’t look up? Do you skip or guess them?
M. T. Yes, I do [skip or guess].
C. K. Do you guess the meanings of unknown words when reading textbooks for your English classes? Do you look them up after guessing their meanings?
M. T. Yes, I do. I eventually look up all unknown words even when I have guessed their meanings.

Similarly, T. T. reported that she looked up all unknown words when preparing for her English classes, although she used a dictionary selectively when reading for general comprehension such as in the reading session. She explained the reason that she looked up all unknown words before her English classes by verbatim translation asked in class:
115. C. K. Do you usually read through a text as you just did in the reading session? I mean, do you read a text without a dictionary while underlining unknown words for the first time, and then look up only important ones among them in the dictionary for the second time?

T. T. Yes, I do. I read a paragraph [without a dictionary] while underlining unknown words [for the first time].

C. K. Then don’t you look up all unknown words?
T. T. No, I don’t. But I look up all unknown words before my English classes because we are required to translate a whole text word by word in class.

Y. M. thought that translation was important for English learning. For him, vocabulary knowledge meant the ability to translate it while reading a text:

116. C. K. When do think that you have mastered a word?
Y. M. I think that I have mastered a word when I can translate it into Japanese with ease when reading a text.

M. S. also appeared to assign an important role to translation. When she consulted a dictionary, she chose an appropriate meaning by checking whether its Japanese translation makes sense in context:

117. C. K. How do you choose an appropriate one from the meanings listed in the dictionary?
M. S. I exclude the ones that I think are obviously inappropriate when I translate them into Japanese and choose the one that I think is appropriate.

Most students wrote down the discovered information, mainly meanings, after they looked up words. They appeared to do so not only to recall the new information but also to translate a text into Japanese, when they reread it. Therefore, some students wrote down not only the meanings of new words but also those of the words that they already knew, as S. T. did:

118. C. K. Do you usually take notes after looking up a word in the dictionary?
S. T. I write down not only the meanings of new words but also those of the words that I already know in order to translate the text into Japanese.
Although they primarily used a dictionary for reading, many students also used a dictionary for writing. They used a Japanese-English dictionary, an English-Japanese dictionary, or both. Many students also used paraphrasing. For example, N. S. (male) depended on both a Japanese-English dictionary and an English-Japanese dictionary for writing:

119.  C. K.  What do you when you cannot think of the word that describes your idea when writing?
   N. S.  I look it up in a dictionary.
   C. K.  What kind of dictionary do you use?
   N. S.  I use a Japanese-English dictionary.
   C. K.  What do you do when you know a word but don’t know how to use it?
   N. S.  I look it up in the dictionary to find out its part of speech and examples.
   C. K.  What kind of dictionary do you use for that?
   N. S.  I use an English-Japanese dictionary.

Although she used a dictionary, M. T. also used paraphrasing for writing:

120.  C. K.  What do you when you cannot think of the word that describes your idea when writing?
   M. T.  I describe it at length by using relative pronouns.
   C. K.  Do you also use a dictionary when writing?
   M. T.  Yes, I do. I use a Japanese-English dictionary.
   C. K.  Do you try to write with the words that you know if possible and use a Japanese-English dictionary if necessary?
   M. T.  Yes, I do.

When they consulted a dictionary, most students looked at a variety of information including meanings, part of speech, pronunciation, examples, grammatical information, usage information, and idioms, particularly for writing. For example, M. S. paid attention to meanings and examples for reading. Examples appeared to help her choose the contextual meaning from those listed in the dictionary. She paid attention to usage information, grammatical information, and examples for writing:

121.  C. K.  What kind of information do you pay attention to when consulting a dictionary for reading?
M. S. I look at meanings, but I look at example sentences when I cannot find the contextual meaning. Sometimes, there is an example sentence similar to that appearing in a text, and I figure out what it means in such context.

C. K. You seem to pay attention to meaning and examples when reading. Then, what kind of information do you pay attention to when writing?

M. S. I pay attention to usage and sentence patterns such as SVO when writing.

C. K. How about example sentences?

M. S. Yes, I also pay attention to example sentences.

Likewise, N. S. (male) paid attention to meanings and grammatical information for reading, whereas he paid attention to example sentences and grammatical information for writing:

122. C. K. What kind of information do you pay attention to when looking up a word in the dictionary for reading?

N. S. Meanings.

C. K. Only meanings?

N. S. Adverbs [prepositions] that come after or before it. For example, I look at what it means when it is followed by “to.”

C. K. Does such information help you find the contextual meaning?

N. S. Yes, it does.

C. K. You have talked about what you do when reading. Then, what kind of information do you pay attention to when writing? Do you use a Japanese-English dictionary when writing?

N. S. Yes, I do.

C. K. What kind of information do you pay attention to?

N. S. I pay attention to example sentences and prepositions that follow a word.

Many students had had very few opportunities for oral communication in and outside the classroom. Although they had been taking a few oral communication courses, they had been mostly listening to or reading scripts, and spontaneous conversation had seldom been taking place. This was particularly the case with agriculture majors. For example, an agriculture major, Y. K., stated that she seldom practiced productive skills such as speaking and writing:

123. C. K. Do you do anything to move your receptive vocabulary to productive vocabulary?

Y. K. I don’t do anything because I have few opportunities for speaking.
C. K. How about writing?
Y. K. I am taking only a reading course and an oral communication course. We mainly read a textbook even in the oral communication course and do not do much speaking.

Although they had more opportunities than agriculture majors, English majors also had limited chances for oral communication. This was also true for students at T University, where more native-English-speaking teachers were available. For example, J. S. did not have many opportunities for oral communication. She thought that vocabulary was important for conversation, but she was not sure because she had not had many chances to speak English, especially with “foreigners”:

124.  C. K. Do you think that vocabulary is important compared with other areas?
J. S. I think that vocabulary is essential for conversation.
C. K. Then, do you think that vocabulary is very important?
J. S. Yes, I do.
C. K. Do you think so based on your experience?
J. S. No, I don’t. I am not sure about this because I seldom talk to foreigners.
C. K. Do you just imagine that vocabulary would be important?
J. S. Yes, I do.

Most students depended on memory strategies such as list making, written repetition, and oral repetition. For example, T. H. made vocabulary cards or used red sheets (transparent sheets that only hide highlighted information) to memorize words:

125.  C. K. What do you do to enhance your vocabulary?
T. H. I made vocabulary cards when preparing for entrance examinations.
C. K. What information did you write on the cards?
T. H. I wrote the form of a word on the front and its Japanese equivalent, part of speech, and derivations on the back.
C. K. How did you use vocabulary cards?
T. H. I memorized them at school.
C. K. Did you try to look at the front of the card and recall the information on the back?
T. H. Yes, I did.
C. K. Don’t you use vocabulary cards now?
T. H. Now, I write down word meanings in the textbook and memorize them by hiding them with a red sheet.

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C. K. Do you try to hide word meanings and recall them?
T. H. Yes, I do.
C. K. Do you do that before exams?
T. H. Yes, I do.

Y. F. memorized words by writing down them many times:

126. C. K. What have you done to enhance your vocabulary?
   Y. F. I have studied only vocabulary.
   C. K. What did you do in such occasions?
   Y. F. I wrote down words many times on used paper such as the back of a flyer
         in a pencil and then in a ballpoint pen.

Some students appeared to make the most of their English classes. For example,

Y. A. reviewed handouts, did homework, and participated in free English classes:

127. C. K. What do you do independently to enhance your vocabulary or English
       proficiency in general?
   Y. A. I review handouts, do homework, and try to attend free English classes as
         often as possible.
   C. K. What do you mean by free English classes?
   Y. A. There are classes offered after school, where teachers give us lessons by
         using handouts.
   C. K. What do they teach? Reading?
   Y. A. [Yes, they teach] reading. They let us do whatever we like. If we would
         like to practice speaking, they speak to us in English.

Although many students stated that they did not have many opportunities for oral
communication in and outside the classroom, H. O. found such opportunities by making
the most of her English classes taught by native-English-speaking instructors:

128. C. K. What do you do to enhance your vocabulary?
   H. O. I try to converse with native-English-speaking teachers in class. I talk with
         them about whatever I like in free conversation time.

Many students did not use a dictionary very often for speaking and listening,
although some did so when they had access to it. When they did not understand a word in
listening, they used strategies such as ignoring, guessing, and asking others. When they
could not think of a word in speaking, they used strategies such as paraphrasing and
asking others. H. O. used ignoring and guessing when listening and used paraphrasing when speaking:

129.  C. K.  What do you do when you cannot understand a word when listening?
        H. O.  I leave it. I will miss other parts, if I stop at it.
        C. K.  Don’t you guess its meaning?
        H. O.  I try to guess its meaning, but I don’t look it up.
        C. K.  What do you do when you cannot think of the word that describes your idea when speaking?
        H. O.  I think of other expressions.

S. T. asked the other speaker or used a dictionary for listening and used paraphrasing for speaking:

130.  C. K.  What do you do when you cannot understand a word when listening?
        S. T.  Do you mean in conversation?
        C. K.  Yes, I do.
        S. T.  I think that it is important to understand what the other speaker says, so I ask him or her about it.
        C. K.  What do you do when you cannot understand a word when listening to a lecture?
        S. T.  I look it up in the dictionary.
        C. K.  What do you do when you cannot think of the word that describes you idea when speaking?
        S. T.  I look for other similar expressions.

Some students, particularly agriculture majors, could not use these strategies very well probably because of the lack of opportunities for oral communication. For example, N. S. (female) used a dictionary for listening, but did not do anything for speaking:

131.  C. K.  What do you when you cannot understand a word when listening?
        N. S.  If I can listen to it several times, I will look it up. I basically look up unknown words when listening though it is troublesome.
        C. K.  What do you do when you cannot think of the word that describes your idea when speaking?
        N. S.  I become silent. I am not sure because I don’t have many chances for speaking.

Many students independently studied English for examinations such as the Test of English for International Communication (TOEIC) and the Jitsuyo Eigo Gino Kentei
(Eiken), which are widely used as qualifying examinations of English ability for admission into school or employment in Japanese society. Passing these examinations becomes important upon graduation when students look for a job. For example, Y. F. studied for the TOEIC and the Eiken:

132.  C. K.  What do you do independently to enhance your vocabulary or English proficiency in general?
Y. F.  I am planning to take a test for level 2 in the Eiken.
C. K.  Do you wish to pass level 2 in the near future?
Y. F.  I passed pre-level 2. I would like to pass level 2 by all means. I am also studying for the TOEIC little by little.

Many students were interested in American or British culture. They voluntarily listened to music or watched movies in English. Some of them consciously paid attention to the vocabulary used in music or movies. For example, M. N. listened to or sang songs in English, while making an effort to understand lyrics:

133.  C. K.  What do you do to enhance your vocabulary or English proficiency in general?
M. S.  Nothing particular, but I sing songs in English. I like music. I sometime translate lyrics into Japanese.

Not all students had had many opportunities to use English in oral communication. However, some students, in particular English majors, created some opportunities for oral communication on their own. Some students engaged in listening activities outside the classroom, such as listening to music, watching a movie, listening to a radio English course, and watching a TV English course, as shown in the above excerpt.

Furthermore, some students practiced speaking skills by talking to foreigners at work, talking to a foreign neighbor, talking to friends in English, attending an English club, and simulating conversation in their mind. For example, an English major, Y. Y.,
tried to translate his thoughts, other people’s conversation, and TV shows into English in his mind:

134. C. K. Do you do anything independently to increase vocabulary or more generally improve your English skills besides studying in or for your English classes?
Y. Y. I think many things by myself in the train and try to translate them into English. When I cannot think of an English word, I consult a dictionary. Also, I listen to other people’s conversation and try to translate it into English in the train. Moreover, I try to translate TV shows with a dictionary. Additionally, I watch movies with captions.

Another English major, Y. H., regularly participated in the meetings of an English club called English Speaking Society (ESS), where she mainly practiced oral communication skills:

135. C. K. Do you use English outside the classroom?
Y. H. I use English in ESS activities.
C. K. What kinds of activities do you do in ESS?
Y. H. We meet during the lunchtime Monday through Friday for activities such as listening, conversation, and games. I just started school, so I have not started it, but from the second term, we meet twice a week after school and join one section, choosing from drama, conversation, debate, and discussion.

Many English majors independently engaged in written activities, although all agriculture majors, except for one, did not read anything independently. Some English majors participated in writing activities such as email exchange. Also, many English majors read various materials, besides textbooks used for their English classes, such as movie scripts, novels, magazines, graded readers, old textbooks, reading exercises, and picture books. For example, M. S. read the novel *Harry Potter*, which was also very popular in Japan. She had read this book in Japanese, which helped her comprehend the English text:
Many students had not received any systematic training in dictionary use. In contrast, many students had received some training in guessing strategies at their high school, *juku*, or *yobiko*. For example, N. S. (female) had never received any systematic instruction on dictionary use, but received some instruction on the use of guessing strategies both using immediate and wider contexts:

137. C. K. Have you received instruction on dictionary use at school?  
N. S. No, I haven’t, but I was taught to use a dictionary after inferring.  
C. K. Have you received instruction on the use of guessing strategies?  
N. S. I was taught to guess the meaning of an unknown word by using textual context and remembering the words with similar shapes.  
C. K. Where were you taught that?  
N. S. I was taught at high school as well as at a *yobiko* because I spent one year preparing for entrance examinations after I graduated high school.

Similarly, S. F. had never received training in dictionary use, but had received training in the use of guessing strategies using wider contexts as preparation for entrance examinations:

138. C. K. Have you received instruction on dictionary use at school?  
S. F. No, I haven’t.  
C. K. Have you received instruction on the use of guessing strategies?  
S. F. I learned them in my reading class at high school. I was told to use guessing strategies because I cannot use a dictionary when taking entrance examinations.  
C. K. What kind of guessing strategy did you learn?  
S. F. I learned to keep reading even if there is an unknown word. I can find a word with a similar meaning if I keep reading and translate the unknown word in the exactly same way.
On the other hand, J. S. had received some, but not comprehensive training in dictionary use, and some training in the use of guessing strategies using immediate contexts:

139.  C. K. Have you received instruction on dictionary use at school?
J. S.  I think that I have received training in the first year of junior high school.
C. K.  What did you learn?
J. S.  I learned that words were alphabetically arranged.
C. K.  Have you received instruction on the use of guessing strategies?
J. S.  Yes, I have.
C. K.  Where and what did you learn?
J. S.  I learned that the words with “un” have negative or opposite meanings, those with “ly” are adverbs, and so on.
C. K.  Did you learn guessing the meanings of words by analyzing them?
J. S.  Yes, I did.

In summary, the learning context, particularly the grammar-translation method and entrance examinations, appeared significantly to impact the use of LPSs and other vocabulary learning strategies by all students as well as their perceptions about vocabulary and English learning. However, some different patterns emerged between English majors and non-English majors, and between those with some communication experiences in English and those with no such experiences. English majors studied English for many different reasons, whereas agriculture majors studied English for a more limited range of reasons. Their motivation appeared to affect their understanding of vocabulary knowledge; English majors understood vocabulary knowledge more broadly than agriculture majors. Many students did not have confidence in vocabulary, particularly in productive vocabulary, although those with some communication experiences were relatively confident about their productive vocabulary.

Many students rapidly enhanced their vocabulary through preparation for entrance examinations by memorizing a commercial vocabulary notebook. Many students
depended on an English-Japanese dictionary. Especially when preparing for English classes, many students looked up all unknown words, including those that they were able to guess. Also, many students thought that translating an English text into Japanese was essential for reading or English learning. Moreover, many students depended on memory strategies such as list making, written repetition, and oral repetition.

Although they primarily used a dictionary for reading, many students also used a dictionary for writing. Most students looked at a variety of information in the dictionary, especially when writing. Although some students used a dictionary, most did not use a dictionary for oral activities. Instead, they used strategies such as asking others, ignoring, and paraphrasing.

Outside their English classes, many students studied for certification examinations such as the TOEIC or the Eiken. Some students listened to music or watched a movie in English. Furthermore, some English majors tried to create opportunities for oral communication on their own. Also, many English majors read English texts independently.

Many students had never received any systematic training in dictionary use, but had received some training in guessing strategies at their high school, juku, or yobiko.

Discussion

The interviews conducted with 22 students, which followed up with the questionnaire administered in the first phase, uncovered a detailed picture of the students’ LPS use in relation to their use of other vocabulary learning strategies. This section discusses the main findings of the interviews in association with the findings of the first phase, the reading session, and other studies wherever possible. Although the interviews
identified similar patterns of the students’ LPS use to those revealed by the questionnaire, they also uncovered somewhat different patterns. The different patterns might have been found partially because the interviews were only conducted with motivated students who volunteered to participate in the second phase of the study, as indicated by their higher mean scores in both the TOEFL and the Vocabulary Levels Test than the original sample of the 226 students. Another reason for this discrepancy may be that the students were asked not only about their LPS use but also about their use of other vocabulary learning strategies.

The interviews elicited the perceived advantages and disadvantages of the students’ dictionaries and their resulting dictionary behavior from both ED and PD users. The interviews identified the perceived advantages of EDs similar to those identified by the questionnaire, such as the ease of searching, portability, a jump function (that allows a user to jump from one entry to another entry within a dictionary and from one dictionary to another dictionary), an idiom search function, an example search function, the capability of recording the words looked up, and the availability of multiple dictionaries. In particular, the ease of searching and portability appeared to be EDs’ major advantages. EDs’ portability made the students more willing to carry a dictionary to school. Moreover, their ease of searching not only motivated the students to consult a dictionary more often but also made them feel more confident about dictionary use.

Furthermore, the students appreciated the availability of multiple dictionaries. They took advantage of the multiple dictionaries, including not only English dictionaries but also a Japanese dictionary or dictionaries of other foreign languages. When they purchased their EDs, they took the kinds of dictionaries available into consideration.
Multiple dictionaries seemed to be particularly helpful because a jump function allows the user to move from one dictionary to another. For example, when the definitions in an English-Japanese dictionary did not help, the students could move to a Japanese dictionary to search for defining Japanese words (if defining Japanese words in the English-Japanese dictionary presented difficulty to them), or move to another English-Japanese dictionary to look at other definitions. Moreover, EDs prompted many of the users to consult a monolingual dictionary, although they used it as a reference material supplementary to a bilingual dictionary. The students would not have used a monolingual dictionary at all if it were not available in their EDs, as indicated by the finding that most PD users did not consult a monolingual dictionary.

Additionally, idiom search and example search functions helped the students locate idioms or examples. In a PD, it is sometimes difficult to locate idioms and examples because they are scattered throughout the entry; sometimes they are found after each sense, and sometimes at the end of the entry. On the other hand, in an ED, a user can retrieve a list of examples or idioms separately from other information by using the idiom and example search functions. With the aid of these additional search routes, the students were able to search idioms or examples more easily without scanning the whole entry.

The interviews also revealed the perceived disadvantages of EDs similar to those identified by the questionnaire, such as the small screen, the difficulty of use, and the inadequate quantity or quality of information. Due to their small screens, the students felt it troublesome to access detailed information or different senses in a long entry because they had to scroll or tap to different screens. Moreover, some ED users, especially those
who recently bought an ED, did not make use of all the functions because of the difficulty of use.

However, the students had different opinions about EDs’ quality or quantity of information relative to PDs; some students perceived PDs as superior to EDs in terms of the amount of headwords, senses, examples, and usage and grammatical information, whereas other students did not recognize any differences or even felt that EDs were superior. The students’ opinions seemed to vary depending on the kinds of PDs and EDs that they compared. More importantly, their opinions were mostly based on their impressions rather than on careful observation. Therefore, it cannot be determined on the basis of their opinions whether PDs actually contain better information than EDs. It may have been the limitation of EDs’ interface design described above, rather than the amount of information, which caused some students to feel that EDs contained less information than PDs (Koyama & Tekauchi, 2003, 2004).

The interviews also identified the perceived advantages and disadvantages of PDs, which were the opposite of those of EDs. The perceived advantages of PDs included the capability of making notations, the quality of information, the ease of use, the availability of illustrations, and the effectiveness for word retention. Many of the students perceived the quality of information as one of the major advantages of PDs, although their judgments were rather subjective, as discussed above.

The ease of use seemed to be another major advantage of PDs. The students’ PDs are easy to use because of such features as colors, illustrations, large fonts, and illustrations. In particular, the dictionaries tailored for intermediate learners, such as Super Anchor and Grand Century, highlight important senses. This feature helped some
students choose the contextual meaning from those listed in the dictionary by limiting their searches.

Furthermore, some PD users preferred a PD due to the capability of making notations. They used a PD for vocabulary learning as well as for comprehension. For example, a PD user marked new information about a word that she encountered in her PD so that she could notice it when she looked it up again. Another PD user marked headwords to figure out how many times she had looked them up. This finding is contradictory to those of the questionnaire, which showed no difference between the PD and ED groups in *dictionary use for vocabulary learning*. This discrepancy may have occurred because the PD group of the second phase included only the avid students who purposefully chose to use a PD.

In contrast, the perceived disadvantages of PDs included limited headwords, heaviness, and time-consuming search processes. Many of the students perceived the heaviness of PDs as one of their major disadvantages. Even some of the PD users, who were satisfied with their PDs, still wished to buy an ED due to its portability. Some PD users were less confident about their dictionary skills because they were unable to look up a word in the dictionary as quickly as ED users.

Although many of the students felt that their PDs contained adequate information, some PD users were not satisfied with the number of headwords or alternative senses. These students used the dictionaries tailored for intermediate learners. The low number of headwords in these dictionaries was also apparent in the reading session, where the students were unable to find the less common words, such as *avian* and *resold*, which may have interfered with comprehension of the text. When they did not find the
information that they were looking for, they usually asked others or borrowed a
dictionary from others. This may partially explain why the questionnaire data showed
that the PD group tended to use *social strategies* more frequently than the ED group.

Whereas the interviews revealed many differences between the PD and ED users,
they did not show many differences between the high- and low-proficiency students in
their perceptions about vocabulary learning and their use of dictionaries or other LPSs.
This finding is contradictory to that of the first phase, where proficiency rather than
dictionary type explained the students’ LPS use. This inconsistency may be because all
the participants of the second phase were enthusiastic about learning English and
employed many LPSs that eventually led to success in learning English.

However, high- and low-ability students differed in terms of their use of some
metacognitive strategies and their dictionary skills. The high-proficiency students
appeared to be more flexible in their reading styles than the low-proficiency students;
many of the high-proficiency students changed their reading styles according to the
reading purpose or the occasion, but many of the low-proficiency students did not. When
reading for overall comprehension of a text, many of the high-proficiency students used a
dictionary selectively; they consulted a dictionary only for the words that were necessary
for comprehending the text or answering comprehension questions, and the words that
could not be guessed from context. When preparing for their English classes, however,
they look up all unknown words. On the other hand, many of the low-proficiency
students always used the same bottom-up or top-down styles. Similarly, Gu (2003) found
that the two successful learners read a text either in a holistic or analytic manner
according to the purpose. Along with his study, the present study suggests that flexibility in reading style is characteristic of successful learners.

Moreover, many of the high-proficiency students appeared to be more independent in their learning than many of the low-proficiency students. Many of the high-proficiency students were able to decide on the words that they wanted to learn on their own; while reading a text, they chose the words that they wanted to remember for later use, according to the nature of words (i.e., frequency, part of speech, perceived usefulness, etc.). In contrast, many of the low-proficiency students depended mostly on their teachers’ instruction. Also, when they were unable to find the information that they were looking for in their dictionaries, many of the high-proficiency students tried to figure it out on their own by using other resources, using contextual guessing, or modifying dictionary information. On the other hand, many of the low-proficiency students depended on others such as teachers and classmates on such occasions, which explains the finding of the first phase that the low-proficiency students used social strategies more frequently than the high-proficiency students.

These features of the high-proficiency students seem to manifest their sophisticated use of metaconigitive strategies. Many previous studies on vocabulary learning strategies (Fan, 2003; Gu, 2003; Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Lawson & Hogben, 1996; Sanaoui, 1995) have shown that metacognitive strategies are crucial for successful language learning. Successful learners have a wider repertoire of strategies and effectively coordinate them. They actively manage their vocabulary learning both in and outside the classroom, by seeking resources, planning their learning, and monitoring their progress. In association with the results of these studies, those of the
interviews underscore the importance of metacognitive strategies in language learning. This finding, however, was somewhat different from that of the first phase. The questionnaire data found that the LPS categories, such as self-initiation and selective use of LPSs, had only low associations with vocabulary size and reading ability. This inconsistency may have occurred partially because the interviews asked the students not only about their LPS use but also about their use of vocabulary learning strategies in general. Since the questionnaire focused on LPSs, it was unable to reveal that the high-proficiency students were more skilled in orchestrating a wide variety of vocabulary learning strategies than the low-proficiency students.

Furthermore, the high- and low-proficiency students differed in their dictionary skills, which corroborates the finding of the first phase that showed moderate associations of lookup strategies with both Vocabulary Levels Test and TOEFL scores. Most of the high-proficiency students reported that they understood both grammar codes and phonetic transcripts in their dictionaries, although they learned these codes and transcripts mainly by actually using dictionaries rather than reading explanatory notes or receiving instruction. On the contrary, many of the low-proficiency students reported that they did not fully understand phonetic transcripts or grammar codes. These findings partially agree with those of Béjoint’s (1981) study, where many of the students did not use the coding systems for syntactic patterns in their dictionaries or read the front matter.

The interviews revealed the students’ overall patterns of use of LPSs and other vocabulary learning strategies as well as their perceptions about vocabulary learning, regardless of proficiency or type of dictionary (ED and PD). Overall, the students were influenced by the grammar-translation method through which they had been primarily
taught reading skills or English. They primarily used an English-Japanese dictionary, although some of the students, especially the ED users, also used a monolingual dictionary. Many of the students depended on a dictionary. Especially when preparing for English classes, many of the students, in particular the high-proficiency students, looked up all unknown words, including those that they were able to guess. They did so partially because they were required to translate a text word by word in their English classes. Moreover, many of the students thought that translation was an essential component of English learning, which is similar to the findings of the retrospective think-aloud protocols that showed the students’ concerns about finding proper Japanese equivalents.

The questionnaire data did not show that the students depended on a dictionary as much as they reported in the interviews; they showed that only 27% of the students consulted a dictionary for more than 90% of unknown words, 27% of the students for 70-90%, 30% of the students for 50-70%, and 17% of the students for less than 50% (when preparing for their English classes). These percentages were actually closer to those found in the retrospective think-aloud interviews (mean = 69%). Again, a possible reason for this disagreement may be that the students who participated in the second phase were more enthusiastic about learning English and consulted a dictionary more often than the original sample. Alternatively, this discrepancy may be due to the differences in the instruments. The students may have reported on the frequency of dictionary consultation higher in the face-to-face interview than in the anonymous questionnaire. Given the fact that similar percentages of dictionary consultation were found in the reading session, however, the most plausible explanation may be that the students might not have depended on a dictionary as much as they reported in the interviews, except for some
occasions such as those where they expected to be called on in their English classes.

These percentages were still high compared with those found in other studies, suggesting that the Japanese students depended on a dictionary; however, they used a dictionary not exclusively but in combination with other LPSs such as ignoring and inferring.

The students primarily used a dictionary for reading, but many of the students also used one for writing. However, they infrequently used a dictionary for oral activities. These findings agree with those of the first phase. When they consulted a dictionary, many of the students looked at a variety of information, including meanings, part of speech, examples, grammatical information, usage information, and idioms, especially when writing. Although they depended mainly on an English-Japanese dictionary, many of the students also used a Japanese-English dictionary for writing, which explains the finding of the first phase that the students used a Japanese-English dictionary the second most frequently following an English-Japanese dictionary.

When they engaged in oral activities, many of the students used strategies such as asking others, ignoring, and paraphrasing. This finding somewhat contradicts those of previous studies (e.g., Baxter, 1980) that point to the inability of Japanese students to use communication strategies.

The students also employed many memory strategies such as the use of lists, the use of cards, written repetition, and oral repetition. Before the entrance examinations for universities, most of the students memorized commercial vocabulary notebooks, which they found useful to increase their vocabulary. Schmitt (1997) also found that these memory strategies were frequently used by Japanese EFL students.
Outside of their English curriculum, many of the students studied English for certification examinations such as the TOEIC or the Eiken. Also, many of them listened to music or watched movies in English. Otherwise, however, most of the students centered their learning on their English curriculum, except for some of the English majors. Other studies also have shown that EFL students frequently use direct, vocabulary-targeted activities rather than independent learning activities outside the classroom (Kobayashi, 2000; Kojic-Sabo & Lightbown, 1999).

Many of the students had not received any systematic training in dictionary use, although they had received some training in guessing strategies at their high school, juku or yobiko. The retrospective think-aloud protocols indicated a high mean rate of guessing as well as a high mean success rate of using it, which may have been the outcomes of some training that they had received.

As discussed above, some of them, especially the low-proficiency students, were not skilled in dictionary use, although many of the students appeared to acquire dictionary skills on their own by using a dictionary. Moreover, some of the ED users did not take full advantage of an ED due to its difficulty of use. These findings suggest that Japanese teachers should not take for granted students’ dictionary skills and should provide students with comprehensive instruction on dictionary use. Additionally, given the popularity of EDs among students, they also should provide some training in the use of EDs. Instruction on the use of dictionaries, including both PDs and EDs, is crucial particularly because students depend on dictionaries for their learning of English.

This section has discussed the main findings of the interviews in association with the findings of the questionnaire, the reading session, and other studies. The interviews
identified patterns of students’ LPS use similar to those uncovered by the other methodological components of the present study and previous studies as well as somewhat different patterns.
CHAPTER 5

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary of the Findings

The present study investigated the use of pocket electronic dictionaries (EDs) as compared with printed dictionaries (PDs) by college-level Japanese learners of English and the relationship between dictionary use and L2 learning in two phases. In Phase 1, quantitative data were collected from 279 students through a questionnaire on lexical processing strategy (LPS) use, the Vocabulary Levels Test assessing vocabulary size, and the Reading Comprehension section of the TOEFL assessing reading proficiency. In Phase 2, both quantitative and qualitative data were collected from 22 students through a follow-up interview about the questionnaire, retrospective think-aloud protocols elicited during the reading session, and two types of vocabulary tests administered a week after the reading session.

This chapter first summarizes the results of this study by combining the results of the two phases, while answering each of the research questions. Then, it discusses the conclusion of the study, followed by the pedagogical implications. Finally, it presents the limitations of the study and recommendations for future research.
Research Question 1

How often and for what purposes do Japanese learners of English use EDs compared with PDs?

EDs have become popular tools for the learning of English by Japanese learners. The results of the questionnaire showed that 72 percent of the 279 students owned an ED, and those who owned it tended to use it exclusively. Seventy-five percent of ED owners primarily used an ED, and an additional 16% of ED owners used an ED more often than a PD, although they also owned a PD. Only 31% of ED owners used an ED and a PD for different purposes.

The questionnaire also revealed that ED users (those who used an ED more often than a PD) consulted a dictionary more often than PD users (those who used a PD more often or as often as an ED) per week (daily use 21%, weekly use additional 65% versus daily use 8%, weekly use additional 55%), although both ED users and PD users depended on a dictionary, and they did not significantly differ in the portion of unknown words that they would look up in a reading task. This may suggest that EDs are more helpful for increasing the number of instances where a dictionary is taken out rather than for increasing the number of times that the dictionary is used during each instance (where a dictionary is taken out).

The perceived advantages of EDs revealed by the questionnaire and the interview included: portability, the ease of searching, the ease in changing from one dictionary to another, the capability of looking up a word that students were not sure how to spell, the availability of an idiom search function, and the availability of multiple dictionaries and practice exercises. Among these advantages, many of the students especially appreciated
EDs’ portability and ease of searching. These advantages appeared to make dictionary consultation more approachable to the students.

In contrast, the perceived disadvantages of EDs included: the unavailability of diverse examples, the unavailability of detailed grammatical information, the unavailability of detailed usage information, a small screen, the difficulty of the use, and the inability to create a notation. Thirty-one percent of ED owners who used an ED and a PD for different purposes used an ED for quick reference of meanings and a PD to look for detailed grammatical or usage information. Since the researcher’s examination against Hartmann’s (1992) criteria of a good learner’s dictionary found that many of the students’ EDs were of high quality, the perceived disadvantages concerning the quantity or quality of EDs may be explained by the EDs’ interface design (Koyama & Takeuchi, 2003, 2004); namely, students felt that their EDs did not contain detailed grammatical or usage information because they had to tap or scroll to different screens for such information.

Research Question 2

Are there any differences between users of PDs and those of EDs in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?

PD users and ED users do not appear to differ significantly in their LPS use. EDs do not appear to influence students’ LPS use negatively. If anything, the effects of EDs are positive rather than negative. The results of the questionnaire show that ED users, particularly those with a small vocabulary, consult a dictionary more often than PD users. The ED group consulted a wider range of dictionaries, such as an English-Japanese dictionary, a Japanese-English dictionary, and a monolingual dictionary, indicating that
the students took advantage of the multiple dictionaries available in their EDs. Moreover, in the small-vocabulary group, the ED group consulted an English-Japanese dictionary (the type of dictionary most frequently used by the students) more often than the PD group. However, the ED and PD groups did not significantly differ in any of the 13 LPS categories, indicating that EDs did not affect the students’ LPS use, except for the sheer frequency of dictionary consultation.

Similarly, the quantitative analyses of the retrospective think-aloud protocols did not find significant differences between the ED and PD groups in any of the rates of use of the three LPS options and the combined LPS options (i.e., consulting after inferring) and the success rates of determining word meanings associated with the two LPS options (i.e., consulting and inferring) and the combined LPS options.

However, there is a possibility that some ED users consult a dictionary at the expense of contextual guessing or deeper lexical processing. The results of the questionnaire showed that although the mean differences were not significant, the ED group employed many of the dictionary strategies more often than the PD group, and the PD group employed guessing strategies more often than the ED group. Likewise, the quantitative analyses of the retrospective think-aloud protocols indicated that despite no significant mean differences, the PD group had a higher rate of inferring, whereas the ED group had a higher rate of consulting. Also, the qualitative analyses of the retrospective think-aloud protocols showed that some ED users consulted a dictionary immediately, without much effort to recall or guess the meanings of unknown or partially known words beforehand. These results are discussed more fully in the next section, which presents the conclusion of this study.
Research Question 3

Are there any differences between large-vocabulary and small-vocabulary students in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?

Regardless of whether they use an ED or a PD, large-vocabulary students employ many of the LPSs related to guessing and dictionary use more frequently than small-vocabulary students. The results of the questionnaire indicated that the large-vocabulary group used 10 of the 13 LPS categories more frequently (i.e., basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, combined use of LPSs, and selective use of LPSs) than the small-vocabulary group, although the small-vocabulary group used social strategies more often than the large-vocabulary group. No differences were found between the large- and small-vocabulary groups in the use of dictionary use for vocabulary learning and self-initiation.

Furthermore, the quantitative analysis of the retrospective think-aloud protocols found that the large-vocabulary group had a significantly higher mean score than the small-vocabulary group for the rate of successful/partially successful guessing. Also, the large-vocabulary group had a higher mean score than the small-vocabulary group for the rate of guessing, whereas the small-vocabulary group had a higher mean score than the large-vocabulary group for the rate of consulting. Although the differences were not statistically significant, this suggests that the large-vocabulary group inferred word
meanings more often and consulted a dictionary less often than the small-vocabulary group within the time limit.

**Research Question 4**

*Are there any differences between high-reading-ability and low-reading-ability students in terms of their use of dictionaries and other LPSs (i.e., inferring, ignoring, and asking others)?*

Once again, regardless of whether they use an ED or a PD, high-reading-ability students employ many of the LPS categories, involving guessing and dictionary use, more frequently than low-reading-ability students. The results of the questionnaire indicated that the high-reading-ability group used the 10 LPS categories similar to those used by the large-vocabulary group (i.e., basic dictionary use, extended dictionary use for meaning, extended dictionary use for usage, extended dictionary use for grammatical information, lookup strategies, self-initiation, note-taking strategies, guessing strategies using immediate context, guessing strategies using wider context, and selective use of LPSs) more frequently than the low-reading-ability group, although the low-reading-ability group used social strategies more often than the high-reading-ability group. No differences were found between the high- and low-reading-ability groups for the use of dictionary use for vocabulary learning and combined use of LPSs.

The *self-initiation* category was more important for distinguishing high- and low-proficiency groups in reading than in vocabulary, whereas the *combined use of LPSs* category was more important for distinguishing high- and low-proficiency groups in vocabulary. Since both *self-initiation* and *combined use of LPSs* had only low associations with Vocabulary Levels Test scores and TOEFL scores, no strong claim can
be made. However, this may indicate that reading extensively is more important for improving reading skills than looking up the words that have already been dealt with through other LPSs such as contextual guessing.

Additionally, the quantitative analysis of the retrospective think-aloud protocols found that the high-reading-ability group had significantly higher mean scores for the rate of successful consulting, the rate of successful/partially successful consulting, the rate of successful/partially successful guessing, and the rate of successful combined LPS use than the low-reading-ability group, although the mean difference for the rate of successful combined LPS use was rather questionable. This indicates that the high-reading-ability group was more successful in determining word meanings when consulting and/or inferring than the low-reading-ability group.

Furthermore, the qualitative analysis of the retrospective think-aloud protocols found that one of the major differences between the high-proficiency and low-proficiency students (in terms of both vocabulary and reading ability) was the use of contexts; the high-proficiency students skillfully used both wider and immediate contexts when consulting or inferring, whereas the low-proficiency students were unable to use global cues successfully and depended on local cues, especially word structures or shapes. This seems to explain partially why the high-proficiency groups had higher means for the success rates of determining word meanings than the low-proficiency groups.

**Research Question 5**

*What is the possible relationship between the use of an ED and a PD and the retention of unknown or partially unknown words?*
EDs do not seem to influence the retention of the word. The results of the two types of vocabulary tests administered a week after the reading session (i.e., the multiple-choice test consisting of six words and the open-ended test consisting of all unknown words identified by each student) found no differences between the ED and PD groups.

Another related finding is that the ED and PD group did not differ in their scores on the comprehension test during the reading session, which suggests that EDs influence neither the retention of words nor reading comprehension. However, when looking at individual scores, three low-scoring ED users in terms of both vocabulary and reading ability had scored very low on the comprehension test. These students also had low rates of guessing. These results are further discussed in the next section.

**Conclusion**

Despite educators’ and researchers’ concerns (Odlin, 2001; Tang, 1997; Taylor & Chan, 1994), this study shows that EDs do not appear to affect students’ LPS use negatively, when the results of statistical comparisons between ED and PD groups are taken into account: language ability rather than dictionary type explains active LPS use. If anything, the effects are positive rather than negative. On the one hand, EDs increase the frequency of dictionary consultation by students, especially those of low vocabulary proficiency. On the other hand, EDs do not significantly affect students’ LPS use, except for the sheer frequency of dictionary consultation. Furthermore, when looking at students’ dictionary use on a daily basis, EDs not only appear to facilitate the consultation of a wider range of dictionaries, including a Japanese-English dictionary and a monolingual dictionary, but also appear to increase the number of instances where a
dictionary is taken out. Furthermore, statistically speaking, EDs do not significantly influence the retention of words or reading comprehension.

The qualitative or descriptive analysis of data, however, indicates that the increase in dictionary consultation does not necessarily have positive effects on L2 reading or word retention. Although no statistically significant differences were found in their LPS use, the PD group might have processed words more deeply than the ED group. The ED users tended to consult a dictionary more often and inferred less often than the PD users. Moreover, some ED users tended to jump right into using a dictionary. If the researcher had administered a vocabulary test, which is more sensitive to a small degree of word learning (e.g., the Vocabulary Knowledge Scale, Paribakht & Wesche, 1993), she might have found some differences between the two dictionary groups in the retention of words.

In particular, some of the low-proficiency students relied heavily on an ED, possibly at the expense of interacting with the textual context, as indicated by their low rates of guessing in retrospective think-aloud protocols, which may have led to their low scores on the reading comprehension test.

The previous studies on EDs have found mixed results on their effects on L2 learners’ dictionary use during a specific task (Aust et al., 1993; Iso & Osaki, 2004; Koyama & Takeuchi, 2003, 2004; Osaki et al., 2003), vocabulary learning (Iso & Osaki, 2004; Koyama & Takeuchi, 2003, 2004; Osaki et al., 2003), and reading comprehension (Aust et al., 1993; Iso & Osaki, 2004; Koga, 1995; Leffa, 1992; Osaki et al., 2003). On the whole, these studies seem to indicate that EDs do not significantly influence student’s dictionary use, reading comprehension, or word retention. However, depending on the difficulty of the text, students’ proficiency or experience, and the nature of assessments,
EDs may have both negative and positive effects. For example, Koyama and Takeuchi (2003) found that although the ED and PD groups did not differ in terms of the number of words looked up among college students, the ED group tended to look up more words among high-school students. In another study, Koyama and Takeuchi (2004) found that although there were no differences between the ED and PD groups in the rate of recall, the PD group scored higher than the ED group in the rate of recognition.

The present study adds to these studies, indicating the complex nature of the effects of EDs. EDs appear to increase the frequency of dictionary consultation by students, particularly by low-proficiency students. In this sense, the effects of EDs on L2 use may be positive. Also, EDs may positively influence long-term L2 learning because frequent dictionary consultation is likely to cumulate in greater vocabulary learning in the long run (Shimizu, 2004). However, EDs may not benefit all students equally. The increase in the frequency of dictionary consultation may be accompanied by varying degrees of decrease in the frequency of inferring. Therefore, frequent dictionary consultation may result in less interaction with the textual context, particularly for some students who are not proficient enough in English or skilled enough in LPS use to take advantage of EDs. For these students, EDs may not necessarily positively influence reading comprehension or word retention.

The lack of clear effects of EDs can be attributed to user experience. Many of the ED users in the previous studies as well as in the present study had extensive experience in using a PD before using an ED. Therefore, they may have transferred what they did with their PDs into their behavior with their EDs. Alternatively, the lack of differences between the two groups may be explained by the complexity of L2 learning, which
involves more than dictionary type, such as L2 proficiency, L1 proficiency, general intelligence, learning styles, and personal preferences.

A unique contribution of this study is that by looking at students’ use of EDs on a daily basis through the questionnaire and the interview (as opposed to the use of one type of dictionary during a specific task), it shows that EDs not only appear to facilitate the use of a wider range of dictionaries but also increase the number of instances where a dictionary is taken out (in contrast with increasing the number of times that the dictionary is used during each instance). These positive effects can be explained by certain characteristics of EDs, such as the availability of multiple dictionaries in one device, the ease of moving from one dictionary to another, the ease of searching, and portability.

Another important finding of this study is that regardless of whether they use an ED or a PD, successful learners in terms of both vocabulary and reading ability use many strategies, involving dictionary use and guessing, more often than less successful learners, although they also use them selectively according to the nature of the word. Previous studies (e.g., Fan, 2003; Gu & Johnson 1996) also found that more proficient students used both strategies related to dictionary use and those related to guessing more often than less proficient students. Along with these studies, this study suggests that dictionary and guessing strategies are not mutually exclusive, and that both are important for L2 learning.

In addition to the findings related to research questions, this study shows that as a group, Japanese students depend on a dictionary, particularly an English-Japanese dictionary, confirming the findings of previous studies on the use of vocabulary learning strategies by Japanese students (e.g., Kobayashi, 2000; Schmitt, 1997). The students of
the present study frequently used a dictionary, although they also used other LPSs such as inferring. Some of them consulted a dictionary to confirm the word meanings they already knew, whereas others consulted a dictionary to find proper Japanese translations. In particular, the students reported that they frequently consulted a dictionary when they were preparing for their English classes. The students’ dependence on a dictionary, as well as their concern about translation, can be partially explained by the grammar-translation method in which they had been taught reading skills.

As Béjoint (2000) laments, despite the centrality of dictionaries in their learning of English, many students had not received systematic training in dictionary use. Although many high-proficiency students had acquired dictionary skills on their own by actually using a dictionary, some low-proficiency students did know how to use a dictionary effectively. Moreover, some of the ED users did not take full advantage of their EDs due to their difficulty of use. Clearly, this indicates the need for comprehensive instruction on dictionary use. Given their popularity among students, some training focusing on the use of EDs also should be provided.

On the whole, the findings of this study mostly corroborate those of previous studies on LPS use. However, this study was able to uncover the comprehensive picture of students’ LPS use by looking at LPS use with multiple methods, including a structured questionnaire, a semi-structured interview, a retrospective think-aloud technique, and tests. Also, the qualitative analysis of data made it possible to understand students’ LPS use in more detailed and holistic manners.
Pedagogical Implications

This study demonstrates that although some concerns remain, overall, EDs do not appear to influence students’ LPS use negatively. This suggests that the use of EDs should not be discouraged. Rather than discouraging the use of EDs, teachers could advise students to use an ED and a PD for different purposes, considering their pros and cons (Ronald, 2004). On the one hand, students could use an ED in reading, for example, which may allow them to understand word meanings more precisely by moving among multiple dictionaries and comparing different definitions. On the other hand, they could use a PD in writing when they need to access detailed grammatical or usage information more frequently. Another example is that for written or oral communication, students could use an ED, which may minimize the interference of the communication processes with its speed of searching, whereas for vocabulary learning, they could use a PD, which allows them to create a notation, browse surrounding words, and look at illustrations.

This study shows that some students do not take full advantage of their EDs due to their difficulty of use. In order to help students use EDs more effectively, instruction focusing on EDs should be provided. Especially, teachers should provide students with instruction on how to take full advantage of an ED by demonstrating available functions on a common model. Moreover, as Tang (1997) suggests, teachers could conduct research in collaboration with ESL students to find out more about EDs’ features and possibilities, as well as the available models. This would help both teachers and students become more familiar with EDs. The results also indicate that some ED users tend to jump right into using a dictionary. Such students should be advised to hold off
consultation, by recalling or inferring word meanings, in order to enhance deeper processing of words.

Additionally, this study demonstrates that dictionary use and guessing are not mutually exclusive; many LPSs involving dictionary use and guessing are related to high proficiency in terms of both vocabulary and reading ability. Therefore, teachers should not frown upon dictionary use for the reason that it hinders contextual guessing, although they also should underscore the importance of using a dictionary selectively.

Although many LPSs are important for L2 learning, the findings suggest that students have not received systematic instruction on their use. Students should be provided with systematic and comprehensive instruction on LPS use in order to master these strategies fully. For example, Nation (2001) suggests that for each of the strategies, such as contextual guessing and dictionary use, learners should spend a total of at least four or five hours per strategy spread over several weeks. Learners need to understand the goal of each strategy and the conditions under which it works; they need to gain the knowledge necessary to use the strategy; and they need enough practice using it.

Instruction on dictionary use could systematically cover all six groups of dictionary skills listed by Nesi (1999a) as the skills that university-level language students need in order to use dictionaries effectively. Nesi chronologically groups the process of dictionary use into five stages: (1) knowing about dictionaries; (2) choosing whether to use a dictionary; (3) locating information; (4) interpreting information; and (5) recoding information. The sixth group includes the skills that are independent of the consultation process (i.e., understanding lexicographical issues). In particular, instruction should focus on the problematic areas identified by this study. Since some students
exclusively use a bilingual English-to-native language dictionary, teachers should prove students with instruction on what dictionaries are available, including monolingual English dictionaries and bilingual native language-to-English dictionaries. Furthermore, teachers should focus on how to locate compounds and idioms. Teachers also should provide instruction on how to look for a variety of information, including collocation, example sentences, and grammatical information. Moreover, instruction should be provided on how to interpret grammar codes and phonetic scripts. Finally, teachers should instruct students in the skills to use a dictionary selectively, recognizing when to use a dictionary and when to turn to other LPSs, and the skills to change reading styles flexibly according to the purpose or the occasion.

Instruction on inferring should focus on how to guess word meanings using both wider and immediate contexts. This study indicates that some low-proficiency students do not use guessing strategies effectively; they depend on local cues such as word structures or shapes, without paying much attention to global cues. Nation (2001) suggests that teachers instruct students in the five-step deductive procedure for guessing from context: (1) decide on the part of speech of the unknown word; (2) look at the immediate context of the word; (3) look at the wider context, that is, the relationship with adjoining sentences or clauses; (4) guess; and (5) check the guess by substituting the guess for the unknown word, breaking the unknown words into parts, etc. Nation recommends that learners suspend the use of word form cues until the final stage, because they can be misleading. In contrast, Fraser (1999a) argues that since the use of word form cues is typically accessed in a fast, automatic manner, teachers would not be able to train students to refrain from their use. In any case, it is important that learners are
aware of the ranges of cues available, including both local and global ones, and that they are capable of checking their guesses against multiple cues, although they may not need to follow the order of the above procedure rigidly.

This study indicates that although many LPSs involving dictionary use and guessing are related to high proficiency in terms of both vocabulary and reading ability, some LPSs are more important for vocabulary learning than reading (e.g., combined use of LPSs), and some LPSs are more important for reading than for vocabulary learning (e.g., self-initiation). These LPSs should be taught considering the desired abilities.

**Limitations of the study**

Although this study was able to uncover the comprehensive picture of students’ use of EDs, PDs, and other LPSs, using multiple methods, the findings of this study need to be cautiously interpreted, keeping in mind the following limitations. First, this section discusses the limitations that are common to both of the two phases of the study. Then, the limitations that are specific to each phase are discussed separately.

**Overall Limitations**

The first overall limitation is that the Reading Comprehension section of TOEFL may not have been administered in the same conditions for all participants. All participants at T University and N University took it in class. However, those at K University took it at home, because the teacher decided that it was inappropriate to administer this test in her classes, where oral communication was taught. The researcher underscored the importance of keeping the time limit on the front page of the test, and the teacher also emphasized it when distributing the test. Moreover, some students took the test to assess their proficiency and therefore recognized the importance of adhering to the
time limit. However, there was no guarantee that all students completed it within the time limit. This may have partially resulted in the high TOEFL scores of the students at K University, although the instructor confirmed that their high scores reflected their proficiency and the students also scored high on the Vocabulary Levels Test, which they completed in class.

Secondly, there were some problems with the sampling procedure. The participants were selected from the three universities, partially due to the researcher’s easy access and familiarity with the research sites, and partially due to the schools’ cultures and students’ English proficiency. Each of the three universities was intended to be typical of other universities with similar school cultures so that as a whole they would be representative of the universities in the region; namely, K University is one of the most prestigious universities, T university is a middle-ranked university, and N University comes between these two in selectivity. However, since there were considerable differences in terms of students’ English proficiency, this sampling procedure caused the majority of students at K University to be assigned to the high-proficiency groups in both vocabulary size and reading ability. In contrast, the majority of the students at T University were assigned to the low-proficiency groups in both vocabulary size and reading ability. This problem was particularly the case in the second phase. Since the participants were selected only from T University and N University in the second phase, high-proficiency groups mainly consisted of students at K University, and low-proficiency groups mainly consisted of those at T University. This sampling procedure may have caused the differences between proficiency groups to result partially from those between schools (i.e., what kind of instruction was offered in each school).
Given the characteristics of the students, however, it seems to be plausible considering the effects of school to be minimal. Most of the students just started their first or second year one to two months before data were collected (between mid May and mid June, 2004). These freshmen and sophomores were still taking general courses, which were more or less similar across schools. Furthermore, before entering college, the students had studied English for more than six years at junior high and high school, whose curricula were developed according to the Japanese national guidelines. They seemed to be comparable in their experiences of learning English.

**Limitations of Phase 1**

The first limitation specific to the first phase, where the questionnaire was administered, is that those who used an ED and a PD with the same frequency were included in the PD group rather than being treated as their own separate group. This decision was made because there were only 16 students in this category, and this group would have been considerably small compared with the other two groups. Furthermore, since this study was interested in how students who depended on an ED differed from those who did not, it seemed reasonable to include the 16 students in the PD group.

The second limitation of the first phase is that the taxonomy of LPSs, on which the questionnaire used in this study was based, was incomprehensive. The LPS items and categories used in this study were mostly based on Gu and Johnson’s (1996) taxonomy of vocabulary learning strategies. However, the researcher added, revised, and discarded some items and categories in Gu and Johnson’s taxonomy to create her own classification focusing on LPSs. She created new items by drawing on other previous literature (Fan, 2003; Kojic-Sabo & Lingtbown, 1999; Koyama & Takeuchi, 1993) and used internal
consistency reliability in order to group these new items and regroup some old items. However, this taxonomy was still in progress, and more work was needed to complete it. In particular, some categories, such as *self-initiation* and *combined use of LPSs*, only included a few items, which may have influenced the reliability or validity of the instrument.

**Limitations of Phase 2**

The first limitation of the second phase, which included the reading session and the interview, is that only a small number of students (*N* = 22) participated in the reading session, and these students were not randomly selected from the 226 students who participated in the first phase of the study. They were selected from only those who indicated their willingness to participate and those who were in the four classes at the two schools to which the researcher had easy access. Although the researcher attempted to select the participants of the second phase so that they were representative of the original sample in terms of their Vocabulary Levels Test scores, TOEFL scores, and demographic information, the 22 students may not have been truly representative of the two dictionary groups in the original sample. For example, the 22 students had higher mean scores for both the Vocabulary Levels Test and the TOEFL than those of the 226 students, probably because this group of students only included those who were motivated enough to volunteer to participate in the second phase. This may partially explain that the interviews did not identify many significant differences between the high- and low-proficiency students in their use of LPSs and other vocabulary learning strategies.

More importantly, the 11 ED users had a slightly lower mean score than the 11 PD users in their Vocabulary Levels Test scores, although the difference was not
statistically significant. This happened because there were more students from which to select in the ED group than the PD group due to the unevenness of the numbers between the ED and PD users in the original sample. The slight difference in vocabulary size between the ED and PD groups may partially explain the finding that the ED group consulted a dictionary more frequently and guessed word meanings less frequently than the PD group.

The second limitation of the second phase is that the researcher decided only to compare the high- and low-proficiency students in terms of both vocabulary size and reading ability when qualitatively analyzing interview data and retrospective think-aloud protocols, because it was extremely challenging to find qualitative differences between the high- and low-proficiency students separately for vocabulary size and reading ability, when reading ability and vocabulary ability were highly correlated ($r = .715$). There were three students who belonged to the high-proficiency group in vocabulary and the low-proficiency group in reading ability and three other students who belonged to the low-proficiency group in vocabulary and the high-proficiency group in reading ability. These students were dealt with separately. Although these decisions were made in order to make the qualitative analyses feasible, it may have made the qualitative analyses less comparable to the quantitative analyses.

The third limitation of the second phase is that the researcher did not use a second rater/coder for the qualitative analyses of interview data and retrospective think-aloud protocols, although she worked with the second rater when she analyzed the retrospective think-aloud protocols quantitatively. The researcher made this decision because this study focused on the quantitative analyses rather than the qualitative analyses, and the
qualitative analyses were performed essentially as a follow-up to the quantitative analyses.

Finally, the conditions where vocabulary posttests were administered in the reading session may have affected the results. The researcher mailed the vocabulary tests to the students a week after the reading session, and the students took the tests at home. Some students may have reviewed some words between the reading session and the vocabulary tests. Furthermore, since the vocabulary tests were mailed and the students completed them on their own, some of them may have used reference materials even though the students were asked not to. However, it is rather unlikely that the students made the extra effort to achieve better scores on the posttests, which they knew had nothing to do with their course grades. Another concern is that the students may have differed in the length of time between the reading session and the vocabulary tests. Although the researcher asked the students in person as well as in writing to complete the tests within three days, it was not always guaranteed that they followed the instruction in the researcher’s absence.

**Recommendations for Future Research**

This study was one of the first to investigate the use of EDs as compared with PDs and the relationship of dictionary use with L2 learning. More studies should be conducted using different populations, types of texts, types of tasks, and research methods/designs, before drawing any conclusions, especially because LPS use appears to depend on many factors, including the characteristics of the learner, the nature of the word, and the nature of the task, among others.
First of all, studies on EDs using different populations are needed. This study found no significant effects of EDs for university students who had extensive experience with a PD before using an ED. However, different populations, such as younger students without much experience with a PD, might reveal a different picture.

Secondly, each of the three methodological components of this study (i.e., a structured questionnaire, a semi-structured interview, and a retrospective think-aloud technique) could be replicated using different participants, instruments, and analytical procedures to increase generalizability of the findings. A researcher could replicate this study by combining all of the three components or two of them, if his or her resources (time, expertise, and money, etc.) permit. Alternatively, a researcher could focus on one component. This study was able to uncover a comprehensive picture of students’ use of EDs and PDs in relation to other LPSs by using multiple methods and analyzing data both quantitatively and qualitatively. Since there are relatively few studies on dictionaries and relatively little is known about dictionary use, this study contributes to the field by revealing a comprehensive picture of students’ dictionary use. However, due to its broader focus, this study may have lacked preciseness in each component. A researcher could focus on one component of this study and replicate it with a more careful design.

Phase 1 of the present study using a questionnaire can be followed up by studies, for example, involving the third group (i.e., an ED/PD group), the development of a more comprehensive taxonomy of LPSs, and the analysis of individual strategies within each category.

When analyzing the questionnaire data, this study did not treat those who used an ED and PD with the same frequency as their own group, mainly because of their small
number; it included those students in the PD group. Studies with larger sample sizes could be conducted so that three groups (i.e., an ED group, a PD group, and an ED/PD group) are compared in their LPS use.

Moreover, the classification of LPSs, on which the questionnaire used in this study was based, was largely developed by the researcher although she drew on literature (e.g., Fan, 2003; Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999). Therefore, this classification is incomprehensive. In order to compile a more complete taxonomy and verify it, more studies looking at the use of LPSs as a whole, like this study, are needed.

Although this study investigated students’ LPS use by using categories, studies looking at the use of individual strategies within each category could be conducted. Such studies can have practical implications by pinpointing important or problematic areas. For example, dictionary makers, both ED and PD makers, could use the information about the frequency of use for various kinds of information available in the dictionary to accommodate users’ needs in the process of compilation.

The reading session of the present study can be built upon by studies with a true experimental design, those including analysis of the direct relationships of students’ LPS use with reading comprehension and word retention, those examining the impact of EDs on time, those using different texts, those focusing on individual words, and those using different types of vocabulary tests accessing retention.

Retrospective think-aloud protocols about LPS use could be collected in more controlled conditions. The researcher chose to have students use their own dictionaries as they usually did, because this study was conducted to follow up the questionnaire that asked about students’ daily dictionary use. However, this made it difficult to generalize
the results to other populations, especially because they were not randomly selected from the original sample. The effects of dictionary type (ED and PD) on LPS use could be compared by randomly assigning students to ED and PD groups and having all students in each group use the same ED or the same PD, with both types of dictionaries having the same contents.

Moreover, this study investigated the relationships between LPS use and vocabulary, and between LPS use and reading ability, by looking at the relationships of LPS use with their scores on standardized proficiency tests, such as the TOEFL and the Vocabulary Levels Test. Studies that look at the relationships of students’ LPS use during a reading session with their scores on the reading comprehension test and/or the vocabulary test administered during or after the session would add more insights into the relationships between LPS use and vocabulary, and between LPS use and reading ability.

Furthermore, this study did not look at the impact of EDs on the time needed for consulting a dictionary and reading text. Some studies found that students looked up words faster and read faster (e.g., Koga, 1995) with access to an ED, and others found no differences (e.g., Koyama & Takeuchi, 2003). More studies are needed in order to determine whether EDs speed up dictionary consultation and reading.

Also, future research should use different types of texts. This study used a short exploratory article about current issues. Studies should be conducted using texts with different lengths, genres, readability, and degrees of topic familiarity.

Additionally, in order to reveal a precise picture of relationship between LPS use and retention of words, this study compared groups according to the LPS options used, the success of LPS use, and the retention of words. This study did not closely look at
individual words; namely, it did not examine the relationship among individual words, the LPS used for them, and their retention. Studies examining the relationship between the LPS use for each word and its retention are needed. These studies, for example, would help us clarify whether the words on which multiple LPSs are used are retained better. Also, future studies could investigate how the natures of individual words (e.g., word classes, familiarity) influence the LPS used for them and their retention.

Furthermore, this study administered a multiple-choice test and a cued recall test one week after the reading session. However, researchers could use different test formats to assess retention. As discussed previously, vocabulary tests that are more sensitive to a small degree of learning (e.g., the Vocabulary Knowledge Scale, Paribakht & Wesche, 1993) could identify differences between ED and PD groups in word retention. Moreover, researchers could administer vocabulary tests over multiple periods of time, namely, immediately after the reading session, one week later, two weeks later, three weeks later, and so forth, in order to examine how words are retained over time.

Finally, this study interviewed only students. Studies can be done, including interviews with other people concerned such as teachers, lexicographers, and ED manufacturers. This could help us understand students’ LPS use more holistically. Furthermore, interviews with students could be conducted longitudinally in order to examine how their perceptions about EDs and PDs change as their familiarity with Es increases.
LIST OF REFERENCES


CITED DICTIONARIES


APPENDIX A

SUPPORT LETTER
Support for Research

Protocol title: The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English

Protocol # 2004E0108

Principal investigator: Dr. Keiko Komiya Samimy
Co-investigator: Chiho Kobayashi

I agree to give the investigators the permission to recruit participants and conduct research in my classrooms. The investigators have explained to me the purpose of the study, the procedures to be followed, the expected duration of the study, and the possible benefits of the study.

Date:
Signed: ________________________________
(Person authorized to give permission to access data)

Signed:
______________________________
(Principal Investigator or his/her authorized representative)
APPENDIX B

RECRUITMENT LETTER FOR PHASE I OF THE STUDY
研究の第一段階への参加のための説明書

学生の皆様へ

この研究の題名は、The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English (日本人英語学習者による印刷辞書と比較した電子辞書の使用) といい、目的は日本人大学生がどのように電子辞書を使用し、又電子辞書の使用が英語学習にどのような影響を及ぼしているかを探ることです。電子辞書の使用が増加している現在、こうした問題を検討することは、学生にとっても教員にとっても重要であると思われます。電子辞書の使用を印刷辞書の使用と比較するので、電子辞書を使用していない人も両方参加してください。

この第一段階の参加者は、まずマルチプルチョイス式の語彙の量を測るテストを受けてもらいます。このテストの所要時間は約 30 分です。さらに、読解力を測るテストも受けてもらいます。このテストでは、比較的短い英文をいくつか読み、それについてマルチプルチョイス式の質問に答えてもらいます。所要時間は約 30 分です。この他、このクラスの英語の成績及、標準テスト（英検など）の結果も参考にさせてもらいます。最後に、電子辞書と印刷辞書の使い方に関するアンケートに答えてもらいます。このアンケートの記入は 20 分から 30 分かかります。

この研究は教育的目的で行うので、研究への参加は予想される危険を伴いません。研究への参加は完全に任意です。研究への参加を拒否することができ、また罰則なしでいつでも研究への参加を取りやめることもできます。この研究に参加しないために成績に影響が及ぶこともありません。すべての情報は極秘に取り扱われます。書面による事前の承認なしに身元が明らかになることはありません。

質問がある方は、下記まで連絡をお願いします。

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小林千穂

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APPENDIX C

ENGLISH TRANSLATION OF THE RECRUITMENT LETTER FOR PHASE I
OF THE STUDY
Recruitment Letter for Phase I of the Study

Dear Students:

I would like you to participate in a study titled “The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English.” The purpose of this study is to find out how Japanese university students use pocket electronic dictionaries and what impact these dictionaries have on the learning of English. Given their increasing popularity, addressing these questions is crucial for both teachers and students. Since the use of pocket electronic dictionaries is compared with that of printed dictionaries, I would like both users and nonusers of pocket electronic dictionaries to participate in the study. This study consists of two phases. I would like all of you to participate in the first phase; however, participation in the second phase is optional.

If you decide to participate in the first phase of the study, you will be asked to take a vocabulary test assessing vocabulary size in a multiple-choice format. This test will take about 30 minutes to complete. Furthermore, you will be required to take a reading test for which you will read short passages and answer comprehension questions in a multiple-choice format. This test will take about 30 minutes to complete. Finally, you will be asked to fill in a questionnaire on the use of printed and pocket electronic dictionaries. It will take about 20-30 minutes to fill in the questionnaire. Also, your course grades and available scores of standardized tests may be used. (The questionnaire will be administered in the middle of May.)

Those who will agree to participate in the second phase will be asked to complete a reading session and a follow-up interview. (You will be asked about your willingness to participate in the second phase in the middle of May.)

Your participation is completely voluntary and you will be free to refuse or withdraw at any time. Your course grades will not be affected in any way if you decide not to participate. All information will be kept as confidential as possible. The results of the study will be reported in my doctoral dissertation and may be published in a scholarly journal.

If you have any questions, please feel free to contact me.

Chiho Kobayashi
The Ohio State University

Permanent Address                     Current Address
313-11 Tsukiyama                      101 Curl Drive #256
Yamato Takada, Nara, 635-0071         Columbus, OH 43210
Japan                                 USA
Phone 0745-(53)-0462                   Phone 1-(614)-688-9756
E-mail kobayashi.28@osu.edu            E-mail kobayashi.28@osu.edu
APPENDIX D

CONSENT FORM FOR PARTICIPATION IN PHASE I OF THE STUDY
同意書

私は、The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English（日本人英語学習者による印刷辞書と比較した電子辞書の使用）という研究の第一段階に協力することに同意致します。

主たる研究者のケイコ・コミヤ・サミミ、または正式代表者の小林千穂は、この研究の目的、手順、予想される所要時間について説明しました。また、見込まれる利益、別の手段がある場合その手段についても説明しました。

私はこの研究についてさらなる質問をする機会を与えられ、またその質問には納得のいく答えを得ました。私は研究への参加をいつでも取りやめることができる、また参加を取りやめても何の罰則も与えられないことを理解しています。

また、標準テストの得点及びクラスの成績の使用に同意します。

最後に、私はこの同意書を読み十分に理解した上で、自主的に署名致します。この同意書の写しを受け領致しました。

年 月 日 署名または印

本人

署名または印

主たる研究者または正式代表者

保護者

証人
APPENDIX E

ENGLISH TRANSLATION OF THE CONSENT FORM FOR PARTICIPATION
IN PHASE I OF THE STUDY
CONSENT FOR PARTICIPATION IN PHASE I OF RESEARCH

I consent to participating in the first phase of a study entitled: The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English.

Keiko Komiya Samimy, Principal Investigator, or her authorized representative, Chiho Kobayashi has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me.

I consent to the use of the following information from my academic records: scores on standardized tests available and course grades.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ____________________________  Signed: ____________________________

(Participant)

Signed: ____________________________  Signed: ____________________________

(Principal Investigator or his/her authorized representative)  (Person authorized to consent for participant, if required)

Witness: ____________________________
APPENDIX F

RECRUITMENT LETTER FOR PHASE II OF THE STUDY
研究の第二段階への参加のための説明書

学生の皆様へ

この研究の題名は、The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English（日本人英語学習者による印刷辞書と比較した電子辞書の使用）といい、この研究の目的は日本人大学生がどのように電子辞書を使用し、又電子辞書の使用が英語学習にどのような影響を及ぼしているかを探ることです。電子辞書の使用が増加している現在、こうした問題を検討することは、学生にとっても教員にとっても重要であると思われます。電子辞書の使用を印刷辞書の使用と比較するので、電子辞書を使用している人よりもいない人も両方参加してください。

この研究の第二段階の参加者は、フォローアップ・インタビュー、リーディング演習、小テストを受けてもらいます。フォローアップ・インタビューでは、第一段階で記入してもらったアンケートの答えに基づき詳細を補ったり、追加の質問に答えたりしてもらいます。リーディング演習では、辞書を使いながら短い英文を読み、それが出てきた新しい単語をどのように扱ったのかを説明してもらいます。フォローアップ・インタビューは20分から30分ぐらい、リーディング演習は60分から80分くらいかかります。フォローアップ・インタビュー、及びリーディング演習はテープに録音されます。1週間後、リーディング演習で学んだことを測るために小テストを受けてもらいます。この小テストの所要時間は約10分です。

この研究は教育的目で行うので、研究への参加は予想される危険を伴いません。研究への参加は完全に任意です。研究への参加を拒否することができ、また罰則なしでいつでも研究への参加を取りやめることもできます。この研究に参加しないために成績に影響が及ぶこともありません。すべての情報は極秘に取り扱われます。書面による事前の承認なしに身元が明らかになることはありません。

質問がある方は、下記まで連絡をお願いします。

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Recruitment Letter for Phase II of the Study

Dear Students:

I would like you to participate in a study titled “The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese University Students.” The purpose of this study is to find out how Japanese university students use pocket electronic dictionaries and what impact these dictionaries have on the learning of English. Given their increasing popularity, addressing these questions is crucial for both teachers and students. Since the use of pocket electronic dictionaries is compared with that of printed dictionaries, I would like both users and nonusers of pocket electronic dictionaries to participate in the study.

If you decide to participate in the second phase of the study, you will be asked to complete a follow-up interview, a reading session, and a quiz for a small incentive. The follow-up interview will require you to expand your responses to the questionnaire by supplying details and additional information. In the reading session, you will be asked to read a short passage using a dictionary, answer comprehension questions, and report on how you dealt with unknown words in the passage. The follow-up interview will take 20-30 minutes, and the reading session will take about 60-80 minutes. The follow-up interview and the reading session will be tape-recorded. Furthermore, your will be asked to come back a week later to take a quiz measuring your learning from the reading session. The quiz will take about 10 minutes to complete.

There are no predictable risks from your participation because this study will be conducted simply for educational purposes. Your participation is completely voluntary and you will be free to refuse or withdraw at any time without penalty. Your course grades will not be affected in any way if you decide not to participate. All information will be used for research purposes only and kept as confidential as possible. Your identity will not be revealed without your written consent.

If you have any questions, please feel free to contact me.

Chiho Kobayashi
The Ohio State University

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Phone 1-(614)-688-9756
E-mail kobayashi.28@osu.edu
APPENDIX H

CONSENT FORM FOR PARTICIPATION IN PHASE II OF THE STUDY
同意書

私は、The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English（日本人英語学習者による印刷辞書と比較した電子辞書の使用）という研究の第二段階に協力することに同意致します。

主たる研究者のケイコ・コミヤ・サミミまたは、正式代表者の小林千穂は、この研究の目的、手順、予想される所要時間について説明しました。また、見込まれる利益、別の手段がある場合その手段についても説明しました。

私はこの研究についてさらなる質問をする機会を与えられ、またその質問には納得のいく答えを得ました。私は研究への参加をいつでも取りやめることができる、また参加を取りやめても何の罰則も与えられないことを理解しています。

また、標準テストの得点、クラスの成績の使用に同意します。

最後に、私はこの同意書を読み十分に理解した上で、自主的に署名致します。この同意書の写しを受領致しました。

年 月 日

署名または印

本人

署名または印

署名または印

主たる研究者または正式代表者

保護者

証人
APPENDIX I

ENGLISH TRANSLATION OF THE CONSENT FORM FOR PARTICIPATION IN PHASE II OF THE STUDY
CONSENT FOR PARTICIPATION IN PHASE II OF RESEARCH

I consent to participating in the second phase of a study entitled: The Use of Pocket Electronic Dictionaries as Compared with Printed Dictionaries by Japanese Learners of English.

Keiko Komiya Samimy, Principal Investigator, or her authorized representative, Chiho Kobayashi has explained the purpose of the study, the procedures to be followed, and the expected duration of my participation. Possible benefits of the study have been described, as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am free to withdraw consent at any time and to discontinue participation in the study without prejudice to me.

I consent to the use of the following information from my academic records: scores on standardized tests available and course grades.

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ____________________________  Signed: ____________________________
(Participant)

Signed: ____________________________  Signed: ____________________________
(Principal Investigator or his/her authorized representative)  (Person authorized to consent for participant, if required)

Witness: ____________________________
APPENDIX J

ENGLISH TRANSLATION OF THE QUESTIONNAIRE
INSTRUCTIONS

This questionnaire is designed to gather information about how you use pocket electronic dictionaries and printed dictionaries. It also includes questions about other lexical processing strategies (strategies used to deal with unknown vocabulary, i.e., inferencing and ignoring). It takes about 20-30 minutes to complete this questionnaire.

This is not a test. This information will be used only for the purposes of the research. Since I am interested in your personal dictionary use, it is important to answer each question as honestly as possible. There are no right or wrong answers. Please reflect on what you typically do.

Thank you very much for your cooperation!

Name: ________________________________

Class: ________________________________

E-mail: ________________________________
Part I: Pocket Electronic Dictionaries

1. Do you own a pocket electronic dictionary?
   a. Yes  b. No

2. If you don’t own a pocket electronic dictionary, why not?

__________________________________________________________________
__________________________________________________________________

3. If you use both a printed dictionary and a pocket electronic dictionary, which type of dictionary do you use more often?
   a. I primarily use a pocket electronic dictionary.
   b. I use a pocket electronic dictionary more often than a printed dictionary.
   c. I use a pocket electronic dictionary and a printed dictionary with about the same frequency.
   d. I use a printed dictionary more often than a pocket electronic dictionary.
   e. I primarily use a printed dictionary.

If you don’t own a pocket electronic dictionary, please skip the following questions.

4. Which type of pocket electronic dictionary do you own?
   Brand: ____________________________________________________________
   Model: ___________________________________________________________
   Cost: _____________________________________________________________

   c. English-English dictionary  d. Thesaurus
   e. Other ( )

6. If you use both a printed dictionary and a pocket electronic dictionary, do you use them for different purposes?
   a. Yes  b. No
If your answer is yes, for which purposes do you use each type of dictionary? Please mark all the items that are true of you.

a. I use a pocket electronic dictionary when I want to know the meaning of the word quickly, while I use a pocket electronic dictionary when I want to look at examples or know more about the usage of the word.
b. I use a pocket electronic dictionary when I want to know the meaning of the word quickly, while I use a printed dictionary when I want to know detailed grammatical information.
c. I use a pocket electronic dictionary for speaking and listening and use a printed dictionary for reading and writing.
d. I use a pocket electronic dictionary at school or in the library and use a printed dictionary at home.

7. Are you satisfied with your pocket electronic dictionary?
   a. Satisfied   b. Somewhat satisfied   c. Dissatisfied

8. What are the perceived strengths and weaknesses of your pocket electronic dictionary? Please mark all the items that are true of your pocket electronic dictionary.

Strengths

a. It is easy and quick to look up a word.
b. It is easy to carry around.
c. It is easy to change from one dictionary to another (e.g. from a Japanese-English dictionary to an English-Japanese dictionary).
d. The spoken pronunciation of the word is available.
e. It allows me to look up the words that I am not sure how to spell.
f. It can be connected to another application.
g. Other (   )

Weaknesses

a. It does not provide detailed information about the usage of the word.
b. It does not contain enough examples.
c. It does not provide enough grammatical information.
d. The screen is small, so I cannot look at the whole entry of the word at one time.
e. The number of the headwords is limited, so I sometimes cannot find the word that I am searching for.
f. It is fragile and easily broken.
g. Other (   )
Part II: Lexical Processing Strategy Use (Strategies Used to Deal with Unknown Words, i.e., Consulting, Inferencing, and Ignoring)

1. How often do you use your dictionary (or dictionaries)?
   a. Daily  
   b. 4 or 5 times per week  
   c. Several times per week  
   d. Once per week  
   e. Less often

2. What percentage of unknown words do you look up in reading? Imagine that you are reading a text to prepare for your English class.
   a. More than 90%  
   b. 70-90%  
   c. 50-70%  
   d. Less than 50%

3. Do you use other types of electronic dictionaries such as CD-ROM (or floppy disk) dictionaries and on-line dictionaries?

<table>
<thead>
<tr>
<th>CD-ROM dictionary:</th>
<th>On-line dictionary:</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. I use it daily.</td>
<td>a. I use it daily.</td>
</tr>
<tr>
<td>b. I use it 4 or 5 times per week.</td>
<td>b. I use it 4 or 5 times per week.</td>
</tr>
<tr>
<td>c. I use it several times per week.</td>
<td>c. I use it several times a week.</td>
</tr>
<tr>
<td>d. I use it once per week.</td>
<td>d. I use it once per week.</td>
</tr>
<tr>
<td>e. I use it less often.</td>
<td>e. I use it less often.</td>
</tr>
<tr>
<td>f. I never use it.</td>
<td>f. I never use it.</td>
</tr>
</tbody>
</table>

4. Where do you use your dictionary?
   a. At home  
   b. In class  
   c. At the library  
   d. Other ( )

5. Please answer the following questions using a five-point scale for the following items.

   1. Never or almost never true of me
   2. Generally not true of me
   3. Somewhat true of me
   4. Generally true of me
   5. Always or almost always true of me

   a. I use an English-English dictionary.
   1   2   3   4   5

1 2 3 4 5

c. I use a Japanese-English dictionary.

1 2 3 4 5

d. I use a dictionary for speaking (e.g., face-to-face conversation, preparing for oral presentations, etc.).

1 2 3 4 5

e. I use a dictionary for listening (e.g., listening to lectures, watching TV, listening to the other speaker in face-to-face conversation, etc.).

1 2 3 4 5

f. I use a dictionary for writing (e.g., writing academic papers, writing letters, writing emails, etc.).

1 2 3 4 5

g. I use a dictionary for reading (e.g., reading academic papers, reading textbooks, reading newspapers, reading magazines, reading websites, etc.).

1 2 3 4 5

h. I use a dictionary to find out the meaning (the Japanese equivalent or the English definition) of a new word.

1 2 3 4 5

i. I use a dictionary to find out the pronunciation of a new word.

1 2 3 4 5

j. I use a dictionary to find out the spelling of a word.

1 2 3 4 5

k. I use a dictionary to find out all the meanings of a new word.

1 2 3 4 5
l. I use a dictionary to find out the contextual meaning of a new word.

m. I use a dictionary to find out the part of speech (e.g., noun, verb) of a new word.

n. I use a dictionary to find out the derived forms of a new word (e.g., inform/information, embarrass/embarrassment, etc.).

o. I use a dictionary to find out the sentence patterns in which a word can be used (e.g., interested in, like to go, etc.).

p. I use a dictionary to find out whether a word is countable or uncountable (i.e., whether a word can be pluralized).

q. I use a dictionary to find out the synonyms and antonyms of a word.

r. I use a dictionary to find out the collocational patterns of a word (i.e., with which words the word is frequently used).

s. I use a dictionary to find out the frequency of a word (i.e., whether it is a common or rare word).

t. I use a dictionary to find out the appropriate usage of a word (e.g., old/modern usage, American/British usage, formal/informal usage, etc.).
u. I pay attention to the examples of use when I look up a word in a dictionary.

1 2 3 4 5

v. I look for phrases or set expressions that go with the word I look up.

1 2 3 4 5

w. I consult a dictionary to find out about the subtle differences in the meanings of English words.

1 2 3 4 5

x. When I want to know more about a word that I already have some knowledge of, I look it up.

1 2 3 4 5

y. When I get interested in another new word in the definitions of the word I look up, I look up this word as well.

1 2 3 4 5

z. I increase my vocabulary by studying a dictionary.

1 2 3 4 5

aa. I look up in my dictionary English words that I have encountered in my independent studies outside class time.

1 2 3 4 5

bb. I look up in my dictionary English words that I have encountered in my independent studies in which I engage in outside class time and write them down (in the margin of the text, my notebook, or my vocabulary notebook).

1 2 3 4 5

cc. I ask a teacher for the meaning of a new word.

1 2 3 4 5
dd. I ask a friend or a classmate for the meaning of a new word.

1 2 3 4 5

e. If a new word is inflected, I remove the inflections to recover the form to look up (e.g., for “created,” look for “create”).

1 2 3 4 5

ff. If a new word I try to look up seems to have a prefix (e.g., “in” for “inconvenient”) or suffix (e.g., “ly” for “conveniently), I will try the entry for the stem (e.g., “convenient”).

1 2 3 4 5

gg. I scan nearby entries of the unknown word that I looked up to find out related words.

1 2 3 4 5

hh. I scan the entry to obtain useful information about a word beyond that which initially motivated the look-up.

1 2 3 4 5

ii. If there are multiple senses or homographic entries, I use various information (e.g., part of speech, pronunciation, style, collocation, meaning, etc.) to reduce them by elimination.

1 2 3 4 5

jj. I try to integrate dictionary definitions into the context where an unknown word was met and arrive at a contextual meaning by adjusting for complementation and collocation, part of speech, and breadth of meaning.

1 2 3 4 5
Please imagine that you are reading a text to prepare for your English class when answering the following items.

a. When reading for comprehension, I guess the meanings of new words without looking up all of them in a dictionary if they are not important for adequate comprehension.

1 2 3 4 5

b. When reading for comprehension, I ignore or skip unknown words if they are not important for adequate comprehension.

1 2 3 4 5

c. I look up every unknown word in a dictionary.

1 2 3 4 5

d. I skim an English passage to understand the main idea without using a dictionary; then I go back and read it carefully using a dictionary.

1 2 3 4 5

e. I know when a new word or phrase is essential for adequate comprehension of a passage.

1 2 3 4 5

f. I know which words are important for me to learn.

1 2 3 4 5

g. I have a sense of which word I can guess and which word I can’t.

1 2 3 4 5

h. I look up words that I’m interested in.

1 2 3 4 5
i. I know what cues in the context (e.g., the structure of the word, the structure of the sentence, and the meaning of the sentence) I should use in guessing the meaning of a particular word.

j. I make a note of words that seem important to me (in the margin of the text, my notebook, or my vocabulary notebook).

k. When I see an unfamiliar word again and again, I look it up.

l. When I want to confirm my guess about a word, I look it up.

m. I look up words that are crucial to the understanding of the sentence or paragraph in which they appear.

n. I write down synonyms or antonyms of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).

o. I write down the meaning (the Japanese equivalent or the English definition) of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).

p. I write down the grammatical information of the word I look up (e.g., part of speech, word structures, and sentence patterns) (in the margin of the text, my notebook, or my vocabulary notebook).
q. I write down information about usage or examples showing the usages of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).

1 2 3 4 5

r. I write down the information about the word I look up in my vocabulary notebook or cards.

1 2 3 4 5

s. I make a sentence using the word I look up.

1 2 3 4 5

t. I use alternative contextual cues (e.g., the structure of the word, the structure of the sentence, the meaning of the sentence, etc.) and try again if I fail to guess the meaning of a word.

1 2 3 4 5

u. I make use of logical development in the context (e.g., cause and effect) when guessing the meaning of a word.

1 2 3 4 5

v. I make use of my experience and common sense when guessing the meaning of a word.

1 2 3 4 5

w. I check my guessed meaning against the wider context (the whole text or the paragraph where the word appears) to see if it fits in.

1 2 3 4 5

x. I make use of my knowledge of the topic when guessing the meaning of a word.

1 2 3 4 5
y. I look for other words or expressions in the passage that support my guess about the meaning of a word (e.g., definitions, paraphrases, examples, etc.).

z. I look at the relationship between the sentence the word is in and other sentences in the paragraph as signaled by linking words (e.g., though, because, etc.) when guessing the meaning of a word.

aa. I consider the main idea of the passage when guessing the meaning of a word.

bb. I make use of the grammatical structure of the sentence when guessing the meaning of a new word.

cc. I make use of the part of speech of a new word when guessing its meaning.

dd. I check my guessed meaning against the immediate context (i.e., the sentence that includes the word) to see if it fits in.

ee. I analyze the word structure (e.g., prefix, root, suffix, etc.) when guessing the meaning of a word.

ff. I look at the relationship between a new word and other words in the same sentence when I guess its meaning.
Part III: Background Information

3. Field of study: _________________________________
4. Scores on standardized tests available: _________________________________
5. How much time each week do you usually spend studying English outside of class (including course-related and self-initiated activities)?
   a. Less than 30 minutes  b. 30 minutes-1 hour  c. 1-2 hours  d. 2-3 hours  e. 3-4 hours  f. 4-5 hours  g. 5-6 hours  h. 6-7 hours  i. 7-8 hours  j. 8-9 hours  k. 9-10 hours  l. More than 10 hours
6. How much time do you spend each week on activities related to vocabulary learning outside of class (including course-related and self-initiated activities)?
   a. Less than 30 minutes  b. 30 minutes-1 hour  c. 1-2 hours  d. 2-3 hours  e. 3-4 hours  f. 4-5 hours  g. 5-6 hours  h. 6-7 hours  i. 7-8 hours  j. 8-9 hours  k. 9-10 hours  l. More than 10 hours
7. Where do you get most of the opportunities to learn/practice English vocabulary?
   a. EFL classes and homework assignments  b. Self-initiated learning activities outside my EFL classes  c. Both
8. Have you received any formal training in dictionary use?
   a. Yes  b. No
9. Are you confident about your ability to use a dictionary?
   a. Confident  b. Neither confident nor not confident  c. Not confident
10. Would you be interested in participating in Phase 2 of the study (that consists of a follow-up interview and a reading session where you read a passage using a dictionary)?
    a. Yes  b. No
APPENDIX K

INDIVIDUAL ITEMS AND ITEMS UNDER 13 CATEGORIES
Individual Items and Items under13 Categories

Items by Themselves

1. I use an English-English dictionary.
2. I use an English-Japanese dictionary.
3. I use a Japanese-English dictionary.
4. I use a dictionary for speaking (e.g., face-to-face conversation, preparing for oral presentations, etc.).
5. I use a dictionary for listening (e.g., listening to lectures, watching TV, listening to the other speaker in face-to-face conversation, etc.).
6. I use a dictionary for writing (e.g., writing academic papers, writing letters, writing emails, etc.).
7. I use a dictionary for reading (e.g., reading academic papers, reading textbooks, reading newspapers, reading magazines, reading websites, etc.).

Basic Dictionary Use

1. I use a dictionary to find out the meaning (the Japanese equivalent or the English definition) of a new word.
2. I use a dictionary to find out the pronunciation of a new word.
3. I use a dictionary to find out the spelling of a word.
4. I use a dictionary to find out the part of speech (e.g., noun, verb) of a new word.

Extended Dictionary Use for Meaning

1. I use a dictionary to find out the synonyms and antonyms of a word.
2. I consult a dictionary to find out about the subtle differences in the meanings of English words.
3. When I get interested in another new word in the definitions of the word I look up, I look up this word as well.

Extended Dictionary Use for Usage

1. I use a dictionary to find out the collocational patterns (i.e., with which words the word is frequently used) of a word.
2. I use a dictionary to find out the frequency of a word (i.e., whether it is a common or rare word).
3. I use a dictionary to find out the appropriate usage of a word (e.g., old/modern usage, American/British usage, formal/informal usage, etc.).
4. I pay attention to the examples of use when I look up a word in a dictionary.
5. I look for phrases or set expressions that go with the word I look up.
6. When I want to know more about a word that I already have some knowledge of, I look it up.
**Extended Dictionary Use for Grammatical Information**

1. I use a dictionary to find out the derived forms of a new word (e.g., inform/information, embarrass/embarrassment, etc.).
2. I use a dictionary to find out the sentence patterns in which a word can be used (e.g., interested in, like to go, etc.).
3. I use a dictionary to find out whether a word is countable or uncountable (i.e., whether a word can be pluralized).

**Dictionary Use for Vocabulary Learning**

1. I use a dictionary to find out all the meanings of a new word.
2. I increase my vocabulary by studying a dictionary.
3. I scan nearby entries of the unknown word that I looked up to find out related words.
4. I scan the entry to obtain useful information about a word beyond that which initially motivated the look-up.

**Lookup Strategies (Skills)**

1. I use a dictionary to find out the contextual meaning of a new word.
2. If a new word is inflected, I remove the inflections to recover the form to look up (e.g., for “created,” look for “create”).
3. If a new word I try to look up seems to have a prefix (e.g., “in” for “inconvenient”) or suffix (e.g., “ly” for “conveniently), I will try the entry for the stem (e.g., “convenient”).
4. If there are multiple senses or homographic entries, I use various information (e.g., part of speech, pronunciation, style, collocation, meaning, etc.) to reduce them by elimination.
5. I try to integrate dictionary definitions into the context where an unknown word was met and arrive at a contextual meaning by adjusting for complementation and collocation, part of speech, and breadth of meaning.

**Self-Initiation**

1. I look up in my dictionary English words that I have encountered in my independent studies outside class time.
2. I look up in my dictionary English words that I have encountered in my independent outside class time and write them down (in the margin of the text, my notebook, or my vocabulary notebook).

**Note-Taking Strategies**

1. I make a note of words that seem important to me (in the margin of the text, my notebook, or my vocabulary notebook).
2. I write down synonyms or antonyms of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).
3. I write down the meaning (the Japanese equivalent or the English definition) of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).
4. I write down the grammatical information of the word I look up (e.g., part of speech, word structures, and sentence patterns) (in the margin of the text, my notebook, or my vocabulary notebook).
5. I write down information about the usage or examples showing the usages of the word I look up (in the margin of the text, my notebook, or my vocabulary notebook).

**Guessing Strategies Using Wider Context/Background Knowledge**

1. I know what cues in the context (e.g., the structure of the word, the structure of the sentence, and the meaning of the sentence) I should use in guessing the meaning of a particular word.
2. I use alternative contextual cues (e.g., the structure of the word, the structure of the sentence, the meaning of the sentence, etc.) and try again if I fail to guess the meaning of a word.
3. I make use of logical development in the context (e.g., cause and effect) when guessing the meaning of a word.
4. I make use of my experience and common sense when guessing the meaning of a word.
5. I check my guessed meaning against the wider context (the whole text or the paragraph where the word appears) to see if it fits in.
6. I make use of my knowledge of the topic when guessing the meaning of a word.
7. I look for other words or expressions in the passage that support my guess about the meaning of a word (e.g., definitions, paraphrases, examples, etc.).
8. I look at the relationship between the sentence the word is in and other sentences in the paragraph as signaled by linking words (e.g., though, because, etc.) when guessing the meaning of a word.
9. I consider the main idea of the passage when guessing the meaning of a word.

**Guessing Strategies Using Linguistic Cues/Immediate Context**

1. I make use of the grammatical structure of the sentence when guessing the meaning of a new word.
2. I make use of the part of speech of a new word when guessing its meaning.
3. I check my guessed meaning against the immediate context (i.e., the sentence that includes the word) to see if it fits in.
4. I analyze the word structure (e.g., prefix, root, suffix, etc.) when guessing the meaning of a word.
5. I look at the relationship between a new word and other words in the same sentence when I guess its meaning.
Combined Lexical Processing Strategies

1. I skim an English passage to understand the main idea without using a dictionary; then I go back and read it carefully using a dictionary.
2. When I want to confirm my guess about a word, I look it up.

Selective Use of Lexical Processing Strategies

1. When reading for comprehension, I guess the meanings of new words without looking up all of them in a dictionary if they are not important for adequate comprehension.
2. When reading for comprehension, I ignore or skip unknown words if they are not important for adequate comprehension.
3. I look up every unknown word in a dictionary.
4. I know when a new word or phrase is essential for adequate comprehension of a passage.
5. I know which words are important for me to learn.
6. I have a sense of which word I can guess and which word I can’t.
7. I look up words that I’m interested in.
8. When I see an unfamiliar word again and again, I look it up.
9. I look up words that are crucial to the understanding of the sentence or paragraph in which they appear.

Social Strategies

1. I ask a teacher for the meaning of a new word.
2. I ask a friend or a classmate for the meaning of a new word.
APPENDIX L

VOCABULARY LEVELS TEST
Appendix 1  Student instruction sheet for the Levels Test

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

1 business
2 clock ___ part of a house
3 horse ___ animal with four legs
4 pencil ___ something used for writing
5 shoe
6 wall

You answer it in the following way.

1 business
2 clock ___ 6 part of a house
3 horse ___ 3 animal with four legs
4 pencil ___ 4 something used for writing
5 shoe
6 wall

Some words are in the test to make it more difficult. You do not have to find a meaning for these words. In the example above, these words are business, clock and shoe.

If you have no idea about the meaning of a word, do not guess. But if you think you might know the meaning, then you should try to find the answer.

Appendix 2  The Vocabulary Levels Test: Version 2
(© Norbert Schmitt)

The 2000 word level

1 copy ___ end or highest
2 event ___ point
3 motor ___ this moves a
4 pity ___ car
5 profit ___ thing made to
6 tip ___ be like

1 accident ___ loud deep
2 debt ___ sound
3 fortune ___ something you
4 pity ___ pride
5 profit ___ having a high
6 tip ___ another

1 coffee ___ money for
2 disease ___ work
3 justice ___ a piece of
4 skirt ___ clothing
5 stage ___ using the law
6 wage ___ in the right way

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

1 dozen ___ chance
2 empire ___ twelve
3 gift ___ money paid
4 tax ___ to the
5 relief ___ government
6 opportunity

1 arrange ___ grow
2 develop ___ put in order
3 lean ___ like more than
4 owe ___ something
5 prefer ___ else
6 seize

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

1 dozen ___ chance
2 empire ___ twelve
3 gift ___ money paid
4 tax ___ to the
5 relief ___ government
6 opportunity

1 arrange ___ grow
2 develop ___ put in order
3 lean ___ like more than
4 owe ___ something
5 prefer ___ else
6 seize

The 3000 word level

1 bull ___ formal and
2 champion ___ serious
3 dignity ___ manner
4 hell ___ winner of a
5 museum ___ sporting event
6 solution ___ building

1 muscle ___ advice
2 counsel ___ a place
3 factor ___ covered with
4 hen ___ grass
5 lawn ___ female
6 atmosphere ___ chicken

1 bull ___ formal and
2 champion ___ serious
3 dignity ___ manner
4 hell ___ winner of a
5 museum ___ sporting event
6 solution ___ building

1 muscle ___ advice
2 counsel ___ a place
3 factor ___ covered with
4 hen ___ grass
5 lawn ___ female
6 atmosphere ___ chicken

*テストはこよりで版。
<table>
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<tr>
<th>1</th>
<th>blanket</th>
<th>holiday</th>
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<tbody>
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<td>2</td>
<td>contest</td>
<td>good quality</td>
</tr>
<tr>
<td>3</td>
<td>generation</td>
<td>wool covering</td>
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<tr>
<td>4</td>
<td>merit</td>
<td>used on</td>
</tr>
<tr>
<td>5</td>
<td>plot</td>
<td>beds</td>
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<tr>
<td>6</td>
<td>vacation</td>
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<table>
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<tr>
<th>1</th>
<th>abandon</th>
<th>live in a place</th>
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<tr>
<td>2</td>
<td>dwell</td>
<td>follow in</td>
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<tr>
<td>3</td>
<td>oblige</td>
<td>order to catch</td>
</tr>
<tr>
<td>4</td>
<td>pursue</td>
<td>leave</td>
</tr>
<tr>
<td>5</td>
<td>quote</td>
<td>something</td>
</tr>
<tr>
<td>6</td>
<td>resolve</td>
<td>permanently</td>
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<td>2</td>
<td>gown</td>
<td>dress</td>
</tr>
<tr>
<td>3</td>
<td>import</td>
<td>goods from a</td>
</tr>
<tr>
<td>4</td>
<td>nerve</td>
<td>foreign</td>
</tr>
<tr>
<td>5</td>
<td>pasture</td>
<td>country</td>
</tr>
<tr>
<td>6</td>
<td>tradition</td>
<td>part of the body which carries feeling</td>
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<th>1</th>
<th>pond</th>
<th>group of</th>
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<td>2</td>
<td>angel</td>
<td>animals</td>
</tr>
<tr>
<td>3</td>
<td>frost</td>
<td>spirit who</td>
</tr>
<tr>
<td>4</td>
<td>herd</td>
<td>serves God</td>
</tr>
<tr>
<td>5</td>
<td>fort</td>
<td>managing</td>
</tr>
<tr>
<td>6</td>
<td>administration</td>
<td>business and affairs</td>
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<table>
<thead>
<tr>
<th>1</th>
<th>drift</th>
<th>suffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>endure</td>
<td>patiently</td>
</tr>
<tr>
<td>3</td>
<td>grasp</td>
<td>join wool</td>
</tr>
<tr>
<td>4</td>
<td>knit</td>
<td>threads</td>
</tr>
<tr>
<td>5</td>
<td>register</td>
<td>together</td>
</tr>
<tr>
<td>6</td>
<td>tumble</td>
<td>hold firmly with your hands</td>
</tr>
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<tr>
<th>1</th>
<th>brilliant</th>
<th>thin</th>
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<tbody>
<tr>
<td>2</td>
<td>distinct</td>
<td>steady</td>
</tr>
<tr>
<td>3</td>
<td>magic</td>
<td>without</td>
</tr>
<tr>
<td>4</td>
<td>naked</td>
<td>clothes</td>
</tr>
<tr>
<td>5</td>
<td>slender</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>stable</td>
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**Academic Vocabulary**

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<td>agreement</td>
</tr>
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<td>3</td>
<td>definition</td>
<td>way of doing</td>
</tr>
<tr>
<td>4</td>
<td>evidence</td>
<td>something</td>
</tr>
<tr>
<td>5</td>
<td>method</td>
<td>reason for</td>
</tr>
<tr>
<td>6</td>
<td>role</td>
<td>believing something is or is not true</td>
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</tbody>
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<table>
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<th>adult</th>
<th>end</th>
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<tbody>
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<td>2</td>
<td>vehicle</td>
<td>machine used</td>
</tr>
<tr>
<td>3</td>
<td>exploitation</td>
<td>to move</td>
</tr>
<tr>
<td>4</td>
<td>infrastructure</td>
<td>people or goods</td>
</tr>
<tr>
<td>5</td>
<td>termination</td>
<td>list of things to do at certain times</td>
</tr>
<tr>
<td>6</td>
<td>schedule</td>
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**The 5000 word level**

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<tbody>
<tr>
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</tr>
<tr>
<td>3</td>
<td>gravel</td>
<td>house</td>
</tr>
<tr>
<td>4</td>
<td>mortgage</td>
<td>small</td>
</tr>
<tr>
<td>5</td>
<td>scar</td>
<td>stones</td>
</tr>
<tr>
<td>6</td>
<td>zeal</td>
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APPENDIX M

ENGLISH TRANSLATION OF PROMPTS FOR THE RETROSPECTIVE
THINK-ALOUD INTERVIEW
English Translation of Prompts for the Retrospective Think-Aloud Interview

(At the beginning)
(These questions are asked based on the observation.)

1. Do you usually use a dictionary frequently? Did you use a dictionary in the reading session as frequently as you usually do?
2. Do you usually write down the meanings of unknown words after consulting a dictionary? Did you do so in the reading session?
3. Did you read the text several times?
4. When did you consult a dictionary, right after encountering a new word, after reading the sentence where the word appears, or after reading the paragraph where the word appears, or after reading the whole text?

(For each word)

5. What did you think about when you first saw [the word] x?
6. Then, what did you do? (Did you consult a dictionary? Did you guess the meaning of the word from context? Did you skip the word?)
7. Why did you use the lexical processing strategy (s) that you used?

(When the student consults a dictionary)

8. What is the determined meaning? (What did you find out?)
9. Did you find it easily? If you had difficulty, what kind of difficulty did you have?
10. Are you satisfied with the determined meaning? (Did you compare the determined meaning with the context?)
11. Did you find other information? (Did they find useful information about the item beyond that which had initially motivated the look-up?)
   (When necessary, for a few words, ask his or her to demonstrate the lookup for the researcher.)

(When the student guess the meaning of the word from the context)

12. What is the determined meaning?
13. How did you guess the meaning? (Did you analyze the structure of the word? Did you look at the other words in the same sentence? Did you consider the main idea of the text?)
14. Are you satisfied with the determined meaning? (Did you compare the determined meaning with the context?)
New ways to die

By Scott T. Hards

The other day over dinner, a TV news story reported that eggs and meat from chickens with avian flu had been resold to restaurants and other businesses. The announcers read the story in a grave tone, suggesting a crisis had struck Japan's food supply. The story's impact on my mother-in-law was quick: "That's scary," she mumbled between bites of food. The fearmongers had done their work.

For the past several months, we've been bombarded with scary news stories about new ways to get sick and die. There's SARS and mad cow disease (or BSE) and now avian flu. Our entire food supply is in jeopardy, they tell us. The media reports their spread and the subsequent scramble by authorities to try to contain the crisis. But among all this, what frequently doesn't get reported, or not enough anyway, is a level-headed analysis of the actual risk.

After my mother-in-law's comment, I quickly reassured her: "The avian flu virus is easily killed if you cook the meat or eggs. In fact, there hasn't been a single case of avian flu spread to humans through eating infected chickens." But for some reason, these facts were missing from the TV report.

Likewise, Japan was quick to ban all imports of beef from the United States when a single cow was found to have BSE there - to squeals of delight from domestic cattle producers - but reports about BSE almost never point out that you cannot get sick by eating regular meat portions of sick cows. It's parts of their nervous systems that present a problem.

And reports from Taiwan about a sole researcher there getting a new case of SARS topped the news that day, but also failed to mention that there's never been a single case in Japan, let alone the fact that more people die from "regular" pneumonia and influenza every day than have died from the entire SARS outbreak globally.

Don't get me wrong: These new diseases do, of course, present a risk (especially to animal handlers and health professionals), but that risk is insignificant when compared to all the old, traditional risks we face daily.

Unfortunately, "news," as the roots of the word imply, needs to be something "new." Old-type stories, like "routine" deaths from car accidents, cancer, strokes and heart disease don't get much air time, even though the vast majority of all deaths are from one of these causes.

So the next time you find yourself getting disturbed or uptight over news reports about the latest rare disease, terrorism, or some horrible unsolved murder somewhere, just turn off the TV, put down your newspaper, or close that Web browser.

Try a self-imposed "news blackout" for a day or so and give yourself a break from the fearmongers. You may find it does wonders for your state of mind.

And while you're relaxing, keep the following in mind: If you live in Japan, watch your weight and blood pressure, and drive safely with your seat belt on, congratulations! You're living one of the lowest-risk lifestyles on the entire planet.

Now pass the chicken, please.
APPENDIX O

COMPREHENSION QUESTIONS
Comprehension Questions

1. What does the author mean when he says, “The fearmongers had done their work”?  
2. What facts were missing from the TV report on avian flu?  
3. What is the problem with the reports from Taiwan on a new case of SARS?  
4. Why are deaths from car accidents, cancer, strokes and heart disease not frequently reported by the media?  
5. Why does the author recommend the “news blackout”?  
6. What is the author’s main point? Use your own words.
APPENDIX P

EXAMPLE OF THE CUED RECALL TEST
Cued Recall Test for N. S. (Female)

テストをした日  平成 16 年 （  ）月（  ）日

テスト 1
かかった時間   （  ）分

以下の単語の意味を日本語で書いてください。思い出さない時は、その他の意味を書いていても構いませんが、なるべく "New ways to die" で使われていた意味を書いてください。何も見ないでやってください。自信がなくても一応書いて下さい。テスト 1 が終わってからテスト 2 をやってください。

avian  strike
ban  stroke
bombard  subsequent
delight  uptight
fearmonger
grave
jeopardy
level-headed
likewise
miss
mumble
pneumonia
reassure
resell
self-imposed
squeal
APPENDIX Q

MULTIPLE-CHOICE VOCABULARY TEST
テスト2

かかった時間 （ ） 分

右の単語の意味を左から選んで記号を記入してください。何も見ないでやってください。自信がなくても一応書いて下さい。

1. avian
2. bombard
3. delight
4. fearmonger
5. jeopardy
6. level-headed
7. likewise
8. pneumonia
9. self-imposed
10. squeal
11. stroke
12. subsequent
13. uptight

A) 安心させる
B) 危険
C) 奇跡を行う
D) 恐怖をあおる人
E) 緊急の処置
F) 緊張した
G) ～を攻撃する
H) 叫び
I) 自主的な
J) 深刻な
K) 心臓病
L) それに続く
M) ただ一人の
N) 同様に
O) つぶやく
P) 当局
Q) 鳥の
R) 肺炎
S) 冷静な
T) 喜び
APPENDIX R

ENGLISH TRANSLATION OF THE INTERVIEW GUIDE
Interview Guide

Vocabulary Learning Strategies

1. How do you define your goals for learning English?
2. Besides your English classes, on what occasions do you use English?
3. Are you confident about your vocabulary knowledge? How do you define your goals for learning English vocabulary? What kind of vocabulary knowledge do you want to increase (e.g., vocabulary for daily life, vocabulary for academics, vocabulary for business, etc.)? Are you confident about your active vocabulary (vocabulary that you can use in writing and speaking)?
4. What does it mean to you when you say you have learned a word?
5. How important is vocabulary learning in learning English compared with other aspects such as grammar and cultural knowledge? What experiences made you think that way?
6. What kinds of techniques do you often use to learn English vocabulary? To understand a word? To retain a word that you learned? Do you deliberately try to change your passive vocabulary (vocabulary that you can handle in reading and listening) into active vocabulary? What kinds of techniques did you use in the past?
7. What have been your most effective methods of learning English vocabulary? What methods have not worked for you?
8. How do you know that a particular word or expression is worth remembering for later use?
9. What kinds of self-initiated activities (those not for your English classes) related to vocabulary learning do you engage in? Please explain briefly each activity.
10. Do you do read other material besides textbooks that interests you?
11. What do you do when you come across new words while listening?
12. What do you do when you come across new words while reading?
13. When you don’t know an English word when speaking, what do you do?
14. When you don’t know an English word when writing, what do you do?

Dictionary Use

1. What types of dictionaries do you have? Do you have printed dictionaries? Do you have pocket electronic dictionaries? What printed dictionaries do you have? What dictionaries do your pocket electronic dictionaries have? Do you use online dictionaries? Do you have CD-ROM (or floppy disk) dictionaries? Do you have specialized dictionaries such as thesauruses, technical dictionaries, usage dictionaries, and idiom dictionaries?
2. Among the dictionaries that you have, which dictionary (or dictionaries) do you use most often? Do you use different dictionaries for different purposes? If so, for what purposes do you use which dictionaries?
3. Do you use a dictionary for reading and writing? How about speaking and listening? What dictionary (or dictionaries) do you use for reading, writing,
speaking, or listening? Do you use different dictionaries for different kinds of activities?

4. When did you buy your dictionary (or dictionaries)? Why did you choose the one (or ones) that you bought?

5. Are you satisfied with your dictionary (or dictionaries)? Why are you satisfied or dissatisfied with your dictionary (or dictionaries)? Can you recall occasions that you could not find what you were looking for?

6. Are you familiar with the features/functions that your dictionary has? Do you understand grammatical codes? Do you understand phonetic transcripts? Did you read the manual/front matter carefully?

7. Do you use your dictionary often? When you look up a word, what information in the entry do you usually pay attention to (e.g., meanings, grammar, examples, pronunciation, idioms, etc.)? In what context do you pay attention to what information?

8. When the word has multiple meanings, do you look at all meanings or the contextual meaning? How do you choose the appropriate one from multiple meanings given in the dictionary? What do you do when you cannot find what you are looking for?

9. Do you use a dictionary often? When do you look up a word while reading an English text? Right after you see an unknown word, after reading the paragraph that contains the word, or after reading the text? Do you look up all unknown words in the text? If not, what kind of words do you look up? What do you do with the rest of unknown words?

10. Do you guess word meaning from the context? If not, what kind of words do you look up? Do you look up a word to confirm your guess about it?

11. What do you usually do when you look up a word in the dictionary? Do you make any special effort to retain the word? Do you write down information about the word? Where do you write it down? Why do you write it down?

12. Do you use a vocabulary notebook, lists, or cards? If so, do you regularly review them?

13. Are you confident about your dictionary skills? Why are you confident or not confident?

14. Have you received instruction on dictionary use at school? If so, when did you receive what kind of instruction? Have you received instruction on guessing word meaning from the context? If so, when did you receive the instruction?

15. What features/functions of your dictionary do you think are the most useful?
APPENDIX S

INDIVIDUAL SCORES
## Individual scores

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