Inferring and Learning EFL Vocabulary Using Morphological and Contextual Clues: Prefix Availability, Contextual Informativeness, and Learner Proficiency

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Abstract

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By

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This study explored the relationship between prefix and contextual information and learner proficiency in learning vocabulary through lexical inferencing. Generally, successful second-language (L2) reading requires learners to gain considerable knowledge of L2 vocabulary (Nation, 2013), through various ways. As it is unrealistic to achieve a large vocabulary by deliberate methods (e.g., using a wordlist and having lessons given by an instructor—*intentional vocabulary learning*), learners have to gain word knowledge through reading or conversation incidentally (i.e., *incidental vocabulary learning*). These two ways of vocabulary learning have a complementary relation (Grabe, 2009); however, the latter is less effective than the former (Elgort et al., 2016). Perfetti and Hart's (2002) lexical-quality hypothesis, however, assumes that processing a large input through comprehension of text leads to an increase in vocabulary knowledge. Nation (2013) has proposed to add to this hypothesis by inferring from the context of input processing and vocabulary learning, by elaborating the validity of the hypothesis's applicability to L2 reading and learning. These theoretical explanations for incidental vocabulary learning in L2 show the importance of being able to infer

the meaning of words effectively from text. Thus, successfully guessing word meanings, or *lexical inferencing* (Haastrup, 1991), is a prerequisite for subsequent learning of the inferred word meanings (Nation & Webb, 2011).

Lexical inferencing is a process of "making informed guesses as to the meaning of a word in light of all available linguistic cues in combination with the learner's general knowledge of the world and awareness of context" (Haastrup, 1991, p. 40). Previous studies on L2 lexical inferencing have focused on clues, such as *morphological clues* in target unknown words and the *contextual information* surrounding target words (e.g., Hamada, 2013; Hamada, 2014; Nakagawa, 2006). As suggested by Haastrup, learners use these linguistic, or in-text, clues both individually and by combining one with the other. Another focus is inferential strategies, such as evaluating their inferences based on the information in the text (e.g., Nassaji, 2003), discarding the old inference, and attempting to make a new one (e.g., Hu & Nassaji, 2014).

However, the combined use of these two in-text clues during inferencing remains to be revealed since either of the clues is not always useful for learners to infer word meanings (e.g., Beck et al., 2003; Nakagawa, 2006), especially as the availability of *bound morphemes* (e.g., prefix and suffix) is assumed to be more complex than *free morphemes*, which do not necessarily require affixes, or *bases*. In addition, results of the recent research suggest effects of vocabulary size and reading proficiency on the use of such clues and the subsequent lexical inferencing success. Moreover, accumulated findings from previous studies on L2 vocabulary learning have argued that the degree to which a learner engages in processing words would affect the subsequent retention of the words explained by Craik and Lockhart's (1972) *depth of processing hypothesis* (e.g., Hulstijn & Laufer, 2003; Knight, 1994). However, this idea suggests that easily inferred word meanings are not necessarily easily retained (Haastrup, 1991).

Therefore, I administered two empirical studies dealing with learners of English as a foreign language (EFL) at universities in Japan, focusing on the ways in which success in lexical

inferencing would be affected by the availability of morphological and contextual clues and learner proficiency (Study 1), and the ways in which this relationship would affect subsequent vocabulary retention (Study 2). The former study contains three experiments. They examined the ways in which EFL lexical inferencing would be affected by morphological clues—in particular, prefix information in target words—(Experiment 1; 35 participants), contextual information (Experiment 2; 20 participants), combined use of prefixes and contextual clues (Experiment 3; 113 participants), and learners' proficiency (in all three experiments). In these experiments, EFL students inferred the meanings of 22 words that contained both known and unknown prefixes (prefix availability) and existed in sentences with varying levels of informative context (contextual informativeness) in a lexical-inferencing task; however, the one conducted in the first experiment was only involved in two prefix conditions. The other differences, in terms of methodology and learner proficiency, were measured as follows: In Experiment 2, the participants reported what they were thinking aloud, as they inferred the meaning of a word presented on the PC screen (i.e., a think-aloud method); the inferencing task in Experiment 1 was in a free-descriptive paper-and-pencil form, whereas the task in Experiment 3 related to a paper-based multiple-choice version; in Experiments 1 and 3, the participants' vocabulary size was measured whereas in Experiments 2 and 3, their reading proficiency was measured. The prefix availability and the sentences containing target words were examined and created through two norming studies. The results of Study 1 are summarized as follows: (a) EFL learners succeed in inferring a word's meaning by making use of morphemes, especially a prefix, in an unknown word when the morpheme is available or already known to them; (b) EFL learners' sensitivity to the availability of morphological clues results in an increased use of certain strategies in the prefix-unavailable condition; and (c) a contextual clue itself may not be effective in lexical inferencing unless it aligns with other available clues, such as discourse information or the learners' proficiency, such as sufficiently

large vocabulary.

In Study 2, two experiments were carried out to examine the ways in which the findings of Study 1 would affect retention of meanings of words inferred with the help of prefixes and contextual clues. In these experiments, 79 (in Experiment 4) and 104 university students (in Experiment 5), respectively, were engaged in two tests of vocabulary and reading proficiency and the paper-based lexical-inferencing task consisting of two conditions, (prefix availability) × 2 (contextual informativeness). After one week, the participants were asked to recall the inferred meanings. The differences between these two experiments were related to a recall task and procedure. The recall test in Experiment 4 presented the spelling of a target word to participants, but in Experiment 5, an experimental passage was provided with the target word replaced with parentheses. This difference was made to reject a possibility for the participants to not recall the inferred word meaning, and instantaneously infer the meaning based on in-word clues while working on the test instead. Besides this difference, the latter experiment also attempted to reveal the effect of an intervention in which learners look up word meaning after inferencing on subsequent vocabulary learning (Mondria, 2003). The findings of these two experiments were as follows: (a) Regarding learning efficacy, learning EFL vocabulary through lexical inferencing is not expected to yield a high return. However, its outcome can fluctuate depending on factors such as clues EFL learners use during inferencing or the degree to which they find inferencing demanding; (b) success in lexical inferencing necessarily leads to learning inferred word meaning, but learning vocabulary from the text requires EFL learners to achieve successful inferencing; and (c) L2 vocabulary size is key to good inference and retention performance. Specifically, EFL learners with a large English vocabulary size possibly use in-word clues (i.e., prefixes) efficiently and switch clue types from prefix to contextual to achieve successful inference, resulting in good performance in terms of vocabulary learning.

General discussion on the results of the two experimental studies above are briefly summarized as follows: (a) With regard to lexical inferencing, the increased use of certain strategies in the prefix-unavailable condition shown by EFL students' verbal self-report suggests that EFL university students are sensitive to the availability of morphological clues, that is, whether in-word morphemes are already known to them; (b) EFL university students' sensitivity to the availability of in-word information works not only at the level of free morphemes—such as bases—but also at the level of bound ones, so they can make the use of morphemes—especially a prefix—in an unknown word; (c) contextual informativeness does not solely affect inference performance; however, this does not mean that context is a useless resource for inferencing on the evidence of EFL students' verbal self-report; (d) L2 vocabulary size contributes to lexical inferencing using prefix knowledge irrespective of contextual informativeness; and (e) EFL students with larger vocabulary size may be able to make use of contextual clues to infer word meaning, but learners with smaller vocabulary sizes are unable to do so. As to vocabulary learning subsequent to lexical inferencing, (f) EFL students with larger L2 vocabulary sizes showed better retention performance through flexible inferencing using both prefix and contextual clues, but their superiority tended to diminish where the meanings of in-text prefixes were known to learners; (g) switching clues to infer word meaning is a part of lexical-inferencing processing that is demanding enough for the inferred word meaning to be retained, and performing this inferential process may allow learners to gain large vocabulary sizes; (h) a contextual sentence where a word's meaning is inferred does not help a learner to recall inferred word meanings, unlike word forms.

This dissertation concludes with some implications for both researchers and teachers of English as a second or foreign language. It provides them clues to understand and investigate into what we can do for L2 learners' lexical inferencing that can lead to a better retention of inferred word meanings.

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Kozo Kamimura

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List of Publications

The present dissertation covers multiple experimental studies reported on in the publications listed below:

Kamimura, K. (2017). Effects of prefix availability and vocabulary size on Japanese EFL lexical inferencing. *Annual Review of English Language Education in Japan*, *28*, 273–287.
(Experiment 1 in Chapter 4)

Kamimura, K. (2018). Effects of prefix and contextual information on Japanese EFL lexical inferencing: A think-aloud study. *Annual Review of English Language Education in Japan*, *29*, 177–192.
(Experiment 2 in Chapter 4)

神村幸蔵. (2018).「多肢選択の解答パターンに基づく未知語推測プロセス診断：形態素・文脈情報の活用から」.『EIKEN Bulletin』, *30*, 27–41.
(Experiment 3 in Chapter 4)

Kamimura, K. (2020). Retention of Inferred L2 Word Meaning Based on Morphological and Contextual Clues. *Annual Review of English Language Education in Japan*, *31*, 161–176.
(Experiment 4 in Chapter 5)

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Chapter 1
Introduction

1.1 Background of the Present Study

Vocabulary learning is necessary for learners of a second language (L2), not least because it is the basis for many linguistic skills, such as listening, speaking, reading, and writing. Regarding L2 reading, previous studies have suggested that successful reading comprehension requires L2 learners to know at least 95% of the words in the text for sufficient reading comprehension, and thus readers need to know about 4,000 to 5,000 words in terms of word family (Laufer & Ravenhorst-Kalovski, 2010). In short, L2 learners need to know a considerable amount of vocabulary for successful reading.

In order to achieve this, learners need to acquire vocabulary in several ways; however, since it is unrealistic to achieve an adequate vocabulary size using deliberate methods (e.g., using a wordlist, having lessons given by an instructor; i.e., *intentional vocabulary learning*), word knowledge must be gained incidentally through learning from reading or conversation (i.e., *incidental vocabulary learning*), as Nation (2013) argues. These two methods of vocabulary learning are considered complementary (Grabe, 2009), although the latter is less effective than the former (Elgort, Candry, Eyckmans, & Brysbaert, 2018). Considering them together, Wolter and Helms-Park (2015) suggest that the following two approaches are necessary for successful L2 vocabulary development: The first is for teachers to encourage deliberate learning, which helps students gain many words together or focus on significant ones. The second is to provide opportunities for extensive reading, which is essential to refine and reinforce students' pre-learned vocabulary knowledge.

Perfetti and Hart (2002) argue that processing additional input through text

comprehension leads to an increase in vocabulary knowledge. Their hypothesis is intended to explain reading in the first language (L1), but Nation (2013) has proposed to extend this hypothesis, based on the similarity in context between input processing and vocabulary learning, to argue for the applicability of the hypothesis to L2 reading and learning. This theoretical explanation of incidental vocabulary learning both in L1 and L2 highlights the importance of being able to effectively infer word meanings from text. Specifically, success in speculating about the meaning of an unknown word, or *lexical inferencing* (Haastrup, 1991), is essential for the subsequent learning of the inferred word meanings (Nation & Webb, 2011).

Lexical inferencing is considered to be a process of "making informed guesses as to the meaning of a word in light of all available linguistic cues in combination with the learner's general knowledge of the world and awareness of context" (Haastrup, 1991, p. 40). In this definition, linguistic cues refer to the kinds of clues available in texts, such as *morphological clues* in words unfamiliar to learners, the *grammatical relations* among words, and the *contextual information* surrounding the words. Previous studies have succeeded in revealing what kinds of clues learners use during inferencing, such as lexical morphology (Nassaji, 2003), grammatical knowledge (Huckin & Bloch, 1993), both local and global contextual information as well as that between sentences (Hamada, 2011, 2013; Nakagawa, 2006), and discourse beyond sentences (Ushiro et al., 2013). Nassaji (2003) has examined what and how learners make use of during inferencing and reported that the morphemes within words were the second most frequently used sources following background knowledge. In addition, as defined by Haastrup (1991) above, learners use these in-text clues not only individually but also in combination with one another. This combined use of in-text clues has also been examined in past literature on L2 lexical inferencing (Hamada, 2014). Besides the use of clues, past research has identified

inferential strategies that learners use, such as evaluating their inferences based on the information in the text (Nassaji, 2003), discarding previous inferences, and attempting to create new ones (Hu & Nassaji, 2014), among others. A series of these studies on L2 lexical inferencing indicates that learners mainly use in-text clues such as morphemes within words and information from context not only individually but in combination.

However, the combined use of these two in-text clues during inferencing remains to be shown, because either morphological (Nakagawa, 2006) or contextual clues (Beck, McKeown, & McCaslin, 1983) alone are not always useful for learners to infer word meanings, especially in that the availability of *bound morphemes* (e.g., prefixes, suffixes) is assumed to be more complex than *free morphemes*, which do not necessarily require affixes, or *bases* (Hamada, 2014). In addition, recent research suggests the effects of vocabulary size and reading proficiency on the use of such clues and subsequent lexical-inferencing success. Moreover, the findings of previous studies of L2 vocabulary learning suggest that the degree to which a learner engages in processing words affects the subsequent retention of the words based on Craik and Lockhart's (1972) depth of processing hypothesis (Hulstijn & Laufer, 2001; Knight, 1994). Concurrently, however, this idea suggests that easily inferred word meanings are not necessarily easily retained (Haastrup, 1991). Some prior studies have investigated the relationship between lexical inferencing based on in-text clues and subsequent incidental learning, except for Zhang and Koda (2012), who showed that the contribution of lexical-inferencing ability to L2 vocabulary knowledge and reading proficiency depends on how well learners can make use of within-word clues.

Therefore, I conducted two empirical studies of learners of English as a foreign language (EFL) at universities in Japan to investigate how success in lexical inferencing is affected by the availability of morphological and contextual clues and learner

proficiency (Study 1), and how this relationship would affect subsequent vocabulary retention (Study 2).

1.2 Organization of the Present Thesis

This thesis consists of seven chapters: Introduction (Chapter 1), Literature Review (Chapter 2), Present Study (Chapter 3), Study 1 (Chapter 4), Study 2 (Chapter 5), General Discussion (Chapter 6), and Conclusion (Chapter 7),

Following the introduction, Chapter 2 reviews the findings of previous studies. It consists of a review of studies on vocabulary knowledge for L2 use, the role of intentional and incidental vocabulary learning, and on L2 lexical inferencing. Chapter 3 addresses the limitations and problems extracted from the previous research, states the purpose of this dissertation, and poses research questions. I then report two empirical studies in Chapters 4 and 5. Study 1 aimed to investigate how success in lexical inferencing was be affected by the availability of morphological and contextual clues and by learner proficiency (Experiments 1–3), while Study 2 examined how this relationship among in-text clues, learner proficiency, and lexical inferencing affected subsequent vocabulary retention (Experiments 4 and 5). The research targets and measurements of these five studies are summarized in Table 1.1.

Chapter 4 describes Study 1 beginning with Experiment 1, which aimed to investigate the effects of morphological clues, in particular prefix information in target words and L2 vocabulary size on EFL lexical inferencing. In this experiment, a total of 35 Japanese EFL undergraduate and graduate students inferred the meaning of 22 target words with prefixes that were either available/unavailable to participants (prefix availability). All target words were presented in sentences that were not sufficiently informative to allow participants to infer the meaning. The prefix availability and

sentences containing target words were examined and created through two norming studies.

Experiment 2 examined the effects of L2 reading proficiency, prefixes, and contextual information on EFL lexical inferencing, focusing on strategies to be used during inferencing. In this experiment, EFL university students engaged in a lexical-inferencing task consisting of 2 (prefix availability: +prefix/–prefix) × 2 (context: +informative/–informative) conditions and an L2 reading-proficiency test. During this think-aloud study, participants reported what they were thinking as they inferred a word's meaning.

Experiment 3 investigated the relationship between the use of clues and learner factors and difficulty faced by EFL learners in lexical inferencing. In addition, this experiment explored the possibility of a simple paper-based task for observing the process participants engage in during lexical inferencing by analyzing the patterns of participants' choice selection.

Chapter 5 presents Study 2, consisting of Experiments 4 and 5. Based on the results of previous studies, both experiments investigated how lexical inferencing using in-text clues affected subsequent vocabulary retention, focusing on prefix availability, contextual informativeness, and learners' vocabulary size and reading proficiency. In these experiments, EFL university students completed two tests of vocabulary and reading proficiency and a paper-based lexical-inferencing task. After one week, the participants were asked to recall the inferred meanings. These two experiments differed in the recall task and procedure so as to eliminate the possibility that participants instantaneously inferred the meaning based on in-word clues while working on the test, and to determine the effect on subsequent vocabulary learning of an intervention in which learners look up word meanings after inferencing (Mondria, 2003).

Chapter 6 includes a general discussion of vocabulary learning through lexical inferencing in EFL learners based on the results and discussions of Studies 1 and 2. Chapter 7 concludes this thesis with a summary of the findings, limitations, and implications for EFL teachers regarding lexical inferencing.

Table 1.1

Overview of the Five Experiments in the Present Study

Study 1: Use of Morphological and Contextual Clues in Lexical Inferencing		
Experiment	**Object of Study**	**Measurement**
Experiment 1	Effects of prefix availability and L2 vocabulary size on lexical inferencing	Lexical-inferencing task (Paper and pencil)
Experiment 2	Effects of prefix and contextual clues and L2 reading proficiency on lexical inferencing	Lexical-inferencing task (Think-aloud method)
Experiment 3	Effects of learner factors on the use of prefix and contextual clues on lexical inferencing	Multiple-choice lexical-inferencing task
Study 2: Retention of Inferred L2 Word Meaning Through Lexical Inferencing		
Experiment 4	Effects of prefix and contextual clues and learner factors on learning the inferred word meaning	Lexical-inferencing task Learning-confirmation test (spelling based)
Experiment 5	Effects of prefix and contextual clues, learner factors, and looking up word meanings on learning the inferred word meaning	Lexical-inferencing task Learning-confirmation test (context-based)

Chapter 2

Literature Review

2.1 Vocabulary Learning and Reading Comprehension

2.1.1 Theoretical Explanation of Lexical Knowledge

Among the various facets of language knowledge, vocabulary knowledge is essential because it is the basis for many linguistic competences, such as listening, reading, speaking, and writing. The previous literature has aimed to explain how knowledge of words is represented in our memory. Although the terms “lexical” and “vocabulary” are synonyms, in this chapter the former is used to address theoretical or psycholinguistic explanations, and the latter is used in settings of education and assessment, with reference to Wolter and Helms-Park (2015).

One of the most famous models is the L1 speech processing model proposed by Levelt (1993). This model assumes that lexical knowledge stored in memory, what is called a *mental lexicon,* plays a part in the use of L1, especially in listening comprehension and speech production. This mental lexicon is put in the center of the model and is said to consist of two parts: *lemmas* and *lexemes*. The lemmas contain word meanings and grammatical information, and lexemes store morphological and phonological information.

To explain the relation between L1 and L2 lexical inferencing in the mental lexicon above, Kroll and Stewart (1994) proposed a revised hierarchical model. This model assumes that L1 and L2 words are stored separately in the mental lexicon, but share a common conceptual system. Also, this model is dynamic in that a representation of an L2 word form and a connection between L1 and L2 would be strengthened according to learners’ proficiency. In contrast, a model of L2 lexical development proposed by Jiang

(2000) explains that L2 vocabulary acquisition would trace a path different from that of L1, and consequently learners gain an L2 lexical entry on a certain trace that qualitatively differs from an L1 speaker' counterpart, based on Levelt's notion of lemmas and lexemes.

To sum up, these models accounting for lexical knowledge in memory assumes that a lexical representation in the mental lexicon contains information on forms such as morphology and meaning.

2.1.2 Multidimensionality of Vocabulary Knowledge and Reading Comprehension

Vocabulary knowledge is also classified into the following three dimensions in term of a situation where a learner uses their internalized lexical knowledge above: *breadth*, *depth*, and *fluency* of vocabulary knowledge (Daller, Milton, & Treffers-Daller, 2007). The breadth of vocabulary, also called *vocabulary size*, means the number of words a learner knows. The depth of vocabulary knowledge denotes the extent to which a learner knows about one word. For example, if one knows that the word *taxi* is used not only as a noun (a car that carries passengers) but also as a verb ([of an airplane] to move on wheels along the ground), they have deep knowledge on *taxi*. Finally, the fluency of vocabulary refers to the extent to which a learner accesses their vocabulary knowledge automatically. Among these aspects of vocabulary knowledge, the breadth of vocabulary is the most important; this is because not only does vocabulary size indicate how many words a learner knows but also is related to a learner's L2 proficiency (Nation, 2013). Indeed, the breadth and the depth of vocabulary knowledge have been reported to contribute to L2 reading performance (e.g., Qian, 2002: Zhang & Koda).

Regarding the amount of vocabulary sufficient for successful reading, researchers have reached one consensus, that is, L2 learners need to acquire a vast amount of vocabulary. For example, Laufer and Ravenhorst-Kalovski (2010) suggested that

successful reading comprehension requires the L2 reader to know at least 95% of the words in the text for sufficient reading comprehension, and thus readers need to know about 4,000 to 5,000 words in terms of *word family*. Nation (2006) argued that 98% of words in the text should be known to L2 readers for unassisted reading, and thus readers need to know about 9,000 words in terms of word family. Although word families cannot simply be converted into lemmas, Grabe (2009) identifies 4,000 word families with approximately 10,000 lemmas. In other words, learners have to know about 10,000 words to read text written in the L2 even when they are provided with instruction by a teacher. Taken together, previous research suggests that a considerable amount of vocabulary is required for fluent, autonomous L2 reading.

2.1.3 Vocabulary Learning for Successful Reading

To gain a considerable amount of vocabulary knowledge, L2 learners have to learn many words in various ways. Such ways of learning are mainly divided into two types in terms of whether the focus of the activity is word learning; so-called *intentional* and *incidental vocabulary learning*. Intentional vocabulary learning refers to the way in which learners memorize words consciously. Trying to memorize words on word lists by writing them and/or reading them aloud are examples of intentional vocabulary learning. Incidental vocabulary learning involves learning vocabulary through reading, listening, and everyday language use when learners' attention focuses on the context of the text (Nation, 2013). One example of this kind of learning is extensive reading, such as reading a lot of newspapers and books.

These relation between these two is not exclusive but complementary (Grabe, 2009). Intentional vocabulary learning is preferable, especially for L2 learners: (a) L2 learners, unlike native speakers, need to start learning from high-frequency words, (b)

they usually have few opportunities for the input and output of L2, and (c) they have a relatively shorter period for language acquisition than native speakers (Nation, 2013). In the other hand, it is believed that through incidental vocabulary learning learners can obtain deep pragmatic knowledge of words, which is not achievable with intentional vocabulary learning, such as connotation, collocates, and register where the words are used (Wolter & Helms-Park, 2015). Taking these together, Wolter and Helms-Park (2015) suggest that both of the following approaches are necessary for successful L2 vocabulary development: One is an approach to encourage deliberate learning, which is useful for teachers to have their students to gain many words together or focus on significant ones. Another is providing opportunity for extensive reading, which is essential to sophisticate and refine students pre-learned vocabulary knowledge.

As stated above, however, the number of vocabulary words previous studies have suggested (i.e., learners have to know about 10,000 words to read text even when provided with instruction in a classroom) does not seem easily achievable for L2 learners, especially in EFL conditions, such as Japan. This is because of their limited opportunity to learn and use their target language(s) in daily life compared to L1 speakers and learners of English as a second language (ESL) (Nation, 2013). In fact, EFL students may not be given sufficient opportunity receive vocabulary instruction even in a formal education. In Japan, for instance, students are supposed to learn only around 3,000 English words in terms of lemma by the time of graduation from high school (Ministry of Education, Culture, Sports, Science and Technology [MEXT], 2008, 2009), which is a much smaller number of words than that of the previous studies' arguments above. As a result, even if they have been taught by a teacher in a classroom, L2 learners, in particular EFL ones, frequently encounter unknown words and sometimes need to learn those words through incidental vocabulary learning.

To cope with such unknown words, L2 learners have been reported to use particular strategies—ignoring them, consulting a dictionary, or inferring the meaning of the words (Ender, 2014). Ignoring unknown words is applicable to adjectives or adverbs because not knowing them is said not to prevent learners from understanding the message of the text (Aebersold & Field, 1997). Using a dictionary is also a good way to find a word's meaning. In addition, consulting a dictionary is found to be effective for vocabulary learning (Cho & Krashen, 1994). However, "throwing away" unknown words does not always work, especially when they are important words such as nouns or verbs. Regarding dictionary use, finding the entry of the word in question sometimes takes L2 learners a long time (Knight, 1994), only to hinder their fluent reading. As for inferring word meaning, or *lexical inferencing*, guessing from context is required not only for incidental vocabulary learning (Nation, 2013) but also for reading comprehension (Zhang & Koda, 2012). Therefore, lexical inferencing can be said to be the best way of the three.

The importance of lexical inferencing for vocabulary learning is also demonstrated in the lexical-quality hypothesis (LQH) proposed by Perfetti and Hart (2002). Lexical quality in this hypothesis refers to the quality of a lexical representation "to the extent that it has a fully specified orthographic representation (a spelling) and redundant phonological representations (one from spoken language and one recoverable from orthographic-to-phonological mappings)" (p. 190). In this hypothesis, a simple circular cause-effect relation between lexical knowledge and reading in L1 is assumed as follows: A reader who has a good lexical knowledge and decoding skills achieves better text comprehension, then the better reading comprehension allows the reader to process more input from text (i.e., a reader reads more texts), and eventually processing more input through comprehension of text leads to an increase in lexical knowledge and decoding skills. This hypothesis and its revised version (Perfetti, 2010) are both intended to explain

the role of lexical knowledge in L1 reading (See Section 2.3 for further theoretical explanations on vocabulary learning through lexical inferencing.).

Nation (2013) proposed adding to the LQH inferring from the context between input processing and vocabulary learning to extend the applicability of the LQH to L2 reading and learning. Nation's explanation goes as follows: An L2 learner who is good at inferring from context increases their lexical knowledge; accumulated lexical knowledge supports skills for decoding and accessing word meaning; these skills allow the learner to comprehend text better; the better reading comprehension leads to processing more input from text; and finally increased input and its processing enable the learner to make more guesses about word meanings.

These two theoretical explanations and the superiority of lexical inferencing to other strategies to deal with unfamiliar words indicate that successfully inferring word meanings from text is necessary for both vocabulary learning and successful reading.

2.2 Lexical Inferencing for Successful Reading

2.2.1 Definition and Theoretical Explanation on Lexical Inferencing

As mentioned above, lexical inferencing is one of the strategies L2 learners use to cope with unknown words in text and is required for successful reading and incidental vocabulary learning. Lexical inferencing is said to be a process of "making informed guesses as to the meaning of a word in light of all available linguistic cues in combination with the learner's general knowledge of the world and awareness of context" (Haastrup, 1991, p. 40). In this definition, linguistic cues refer to kinds of clues that are available in texts such as *morphological clues* in words unfamiliar with learners, *grammatical relations* among words, the *contextual information* surrounding the words, and so on.

Previous studies have also revealed how learners process such clues when they are engaging in reading comprehension. Huckin and Bloch (1993) explained the specific dynamics of lexical inferencing using those clues described above. They investigated Chinese EFL learners' use of clues in the process of inferring word meaning using the think-aloud method and found that the types of clues learners used changed from morphological ones to contextual ones, suggesting that learners were testing their hypotheses on word meaning.

Based on this finding, Huckin and Bloch created a model of the lexical-inferencing process (Figure 2.1). According to the model proposed by Huckin and Bloch, L2 learners test their hypotheses on word meaning through knowledge of text schema, grammar, morphology, and so on. It should be noted that this model of the inferencing process includes the concept of a temporary memory store. The temporary memory store is similar to a notion of *working memory* (Baddeley, 1986), which is said to involve the processing and retention of information. It is assumed that linguistic input enters working memory through a unit called a *phonological loop*, which connects linguistic input with the central executive of the working memory and can restore information only for a few seconds (Baddeley, 1986) The phonological loop is said to be effective not only in L1 speakers' but also in L2 learners' silent reading (Kadota & Noro, 2001), on the evidence of the finding that learners' capacity of working memory affected Japanese EFL learners' reading comprehension (Tanaka, 2015).

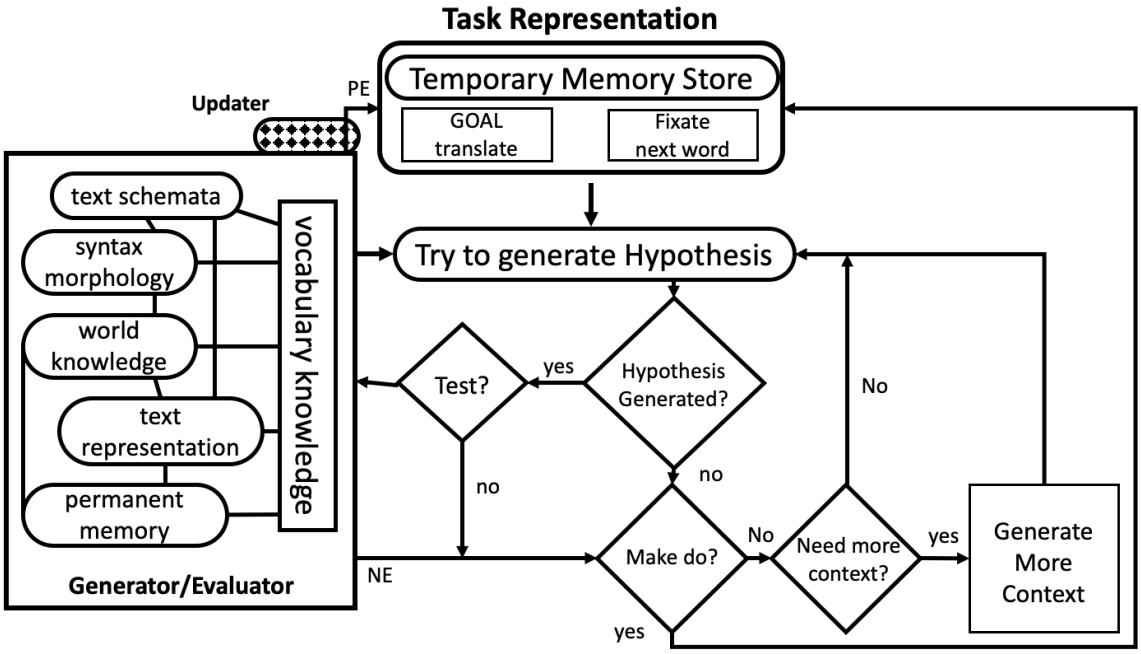


Figure 2.1. The model of lexical-inferencing process proposed by Huckin and Bloch (1993). PE = Positive Evaluation, NE = Negative Evaluation.

On the other hand, de Bot et al. (1997) argue that lexical inferencing involves filling empty slots in a *mental lexicon* with the missing information, based on Levelt's (1993) model of lexical processing performed by L1 speakers. When L2 learners encounter an unknown word (or a target word), they begin by comparing the form of the target word with information stored in the lexemes. At the same moment, the learners make use of the meaningful morphological information of the target word, information from the sentence that surrounds the target word, and world knowledge. Finally, they connect the target word with concepts that they already know. Taking into account the propositions provided by these studies above, the process of lexical inferencing seems to involve (a) combining available clues, (b) testing a hypothesis on word meaning using available clues, and (c) connecting unknown words with known concepts that learners already have.

2.2.2 Merits and Problems on Lexical Inferencing

Previous studies (e.g., Mondria, 2003; Zhang & Koda, 2012) have investigated the effects of lexical inferencing on vocabulary learning and reading comprehension. For vocabulary learning, Mondria (2003) compared the effects of inferencing alone with those of verifying the correct meaning of a word after inferencing on the retention of word meaning for two weeks. Mondria reported that 6% of target word meanings were retained in the inferencing condition, whereas 15% were retained in the inferencing plus verifying condition. This result suggests that, although inferring word meaning by itself may not help learners increase their vocabulary knowledge quickly, it could become more helpful in combination with other activities such as consulting a dictionary. As to reading, Zhang and Koda (2012) showed that the ability to infer a word's meaning indirectly contributed to reading comprehension through the mediation of vocabulary knowledge.

However, there is a problem with learning vocabulary and improving reading comprehension through lexical inferencing: a low rate of success. Knight (1994), who investigated L2 learners' ability to learn vocabulary from context, reported that, on average, only 6% of target words were recalled correctly in an immediate L2-L1 translation task, and only 27% were correctly chosen in an immediate multiple-choice test. Nassaji (2003), who examined L2 learners' use of clues for word inferencing using the think-aloud method, showed that learners inferred 25.6% of target words correctly and 18.6% with partial correctness. Bensoussan and Laufer (1984) had L2 learners read a text in which 12% of the words were unfamiliar, which resulted in learners inferring only 13% of the target words correctly. One possible reason for this low rate of successful inferencing is the extent to which clues are available for L2 learners to infer word meaning. Previous studies support this explanation (de Bot et al., 1997; Huckin & Bloch, 1993): L2 learners guess word meaning based on available clues. Indeed, the use of clues to infer

word meaning has been examined before. In the following section, I will review previous research that has addressed the use of available clues for lexical inferencing.

2.2.3 Use of In-text Clues for Lexical Inferencing

As in Haastrup's (1991) definition, learners make use of various sources of information to make guesses about word meanings. Past literature on lexical inferencing has examined what kinds of clues are actually used by L2 learners during inferencing (e.g., de Bot et al., 1997; Hu & Nassaji, 2014; Huckin & Bloch, 1993; Nassaji, 2003; Paribakht & Wesche, 1999). For example, Paribakht and Wesche (1999), who aimed to examine ESL learners' incidental vocabulary learning from text, revealed the sources that accounted for clue use during lexical inferencing, such as grammar (35%; e.g., identifying a word's part of speech based on word order), in-word morphology (15%; e.g., roots and affixes such as *-tion*, *-ly*), and punctuation (11 %; e.g., uppercase letters for proper nouns, commas used to seriate multiple things). Interestingly, this result was different from that of Nassaji (2003), who also examined the use of clues by ESL learners during inferencing. He found learners used their world knowledge the most (46.2%; i.e., background or prior knowledge), followed by knowledge of word morphology (26.9%), grammar (11.5%), discourse (8.7%; e.g., context in a passage), and their L1 (6.7%; a cognate between L1 and L2).

Based on the findings from past research, Nation (2006) proposed the classification of information sources that are used by L2 learners for lexical inferencing clues used by L2 learners for lexical inferencing proposes the following: (a) clues included in a clause or sentence that contains an unknown word, (b) clues close to or surrounding a clause or sentence that contains an unknown word, (c) information located further from clues mentioned in (a) or (b), (d) knowledge on the characteristics of the text that a learner is

reading, (e) background knowledge that is not described in the text, (f) readers' general world knowledge, and (g) morphological information included in an unknown word.

These clues listed by Nation (2006) seem to be divided into two types based on whether they are solely available in a text: Clues mentioned in (a)–(c), and (g) are clues available from the text, whereas the others in (d)–(f) are not; learners need somehow to gain certain knowledge before reading. This difference would be important in an educational setting. In instructing how to infer word meanings from text in a classroom, a teacher may be able to prepare teaching materials considering their students' background knowledge or interests. However, learners do not necessarily encounter unknown words in texts that are related to their prior knowledge or interests, and this could happen when they are required to read to learn novel information for academic or business purposes. For this reason, it would be useful for both L2 teachers and learners to know how making use of in-text clues such as information in an unknown word and its surrounding context would lead to successful lexical inferencing.

Taking these into consideration, I will focus in this study on the roles of clues available in a text during inferencing, in particular morphological and contextual clues. Therefore, the following sections will examine findings on how morphological and contextual clues play a significant part in lexical inferencing.

2.2.3.1 Role of Morphological Clues in Lexical Inferencing

Characteristics of in-word morphology. As mentioned above, one of the clues available in a text to infer the meaning of an unknown word is the morphological information in the word itself (de Bot et al., 1997; Haastrup, 1991), sometimes called *word part* (e.g., Nation, 2013). A large proportion of English words can be divided into their smallest meaningful units (i.e., *morphemes*). For instance, *blackboard* and *unhappy*

can be decomposed into *black* and *board* and *un* and *happy*, respectively. A morpheme that can stand as a word by itself (e.g., *black*, *board*, *happy*) is called a *free morpheme*, whereas one that cannot exist as a word alone (e.g., *un*) is called a *bound morpheme,* and a bound morpheme that makes a derivational word by attaching to a word is called a *derivational affix*. Nation (2013) summarized findings from past L2 research and created a list of derivational affixes for learners, what he calls, a *sequenced list of derivational affixes for learners of English* (p. 395).

There are, however, some points to note regarding morphological clues. First, the meaning of a morpheme in a word is not always linked to the whole meaning of the target word learners infer. The meaning of a morpheme in a word usually has a semantic relation to the word itself; for instance, the prefix *un-* expresses a negative sense, so the word *unhappy* denotes the state of not being happy. However, there are some exceptions to this relation; the word *uncanny*, for example, does not mean the opposite state of being canny, although these two words used to be antonyms. In addition, some English morphemes are polysemous; for example, the prefix *ex-* means both "out" and "former." For this reason, it is possible that a learner actually knows one meaning of a morpheme in an unfamiliar word, but that it is different from that included in the word. Last, the meaning of a prefix in a target word is linked to the whole meaning of the target word the learners infer. These two negative features of in-word clues need to be considered when researchers investigate in detail the role of morphological clues in lexical inferencing.

Processing in-word morphological information. Past research on processing in-word information has revealed that the meaning of a novel multiple-morphological word can be processed into morphological units by both L1 (e.g., Silva & Clahsen, 2008; Taft & Forster, 1976) and L2 speakers (e.g., Morita, 2010), but the degree of this processing would depend on its morphological complexity (Morita, 2010) and the difference between

L1 and L2 (Silva & Clahsen, 2008). There are two views on processing multiple-morphological words: One is the *decompose route*, in which one processes a word by decomposing it into morphemes. Another is *the whole-word route*, where one processes a word without dividing it into its constructs. (Taft & Forster, 1976). For example, Taft and Forster (1975) showed that prefixed words are analyzed into their constituent morphemes before lexical access occurs in L1 (e.g., rejuvenate → *re-* and *-juvenate*).

Regarding the processing of morphologically complex words in L2, Silva and Clahsen (2008) compared the differences between L1 and L2 speakers' processing of morphologically complex English words that consist of roots and suffixes (e.g., rigidity → *rigid*, *-ity*). They showed that adult L2 learners were less likely than L1 speakers to analyze the words based on their in-word clues and more likely to process them as a whole. Similarly, Morita (2010) examined the decomposition of English words by EFL learners using productive and semantically and phonologically transparent suffixes and unproductive, and semantically and phonologically opaque ones (e.g., *-ness* as in *kindness* vs. *-ity* as in *ethnicity*). As a result, learners with a larger vocabulary switched their processing route from the decompose to the whole-word route according to the difference in words' suffixes, but those with a smaller vocabulary tended to decompose the words irrespective of the suffix type.

Taken together, the results of these studies investigating word processing show that both L1 and L2 speakers are able to decompose a word into its components, but the quality of the processing by L2 learners possible depends on their L2 proficiency.

Merit of decomposing words into morphemes. It has also been revealed that decomposing a word into its morphemes and integrating each morpheme's meaning contributes to both lexical inferencing and subsequent vocabulary learning. As for lexical inferencing, previous studies revealed that such a morphological analysis helps both L1

(McCutchen & Logan, 2011) and L2 speakers to infer word meaning (Zhang & Koda, 2012). Such ability to reflect and manipulate morphological clues is called *morphological awareness*, and these studies showed its effectiveness for lexical inferencing.

In addition, previous studies have found that dividing words into morphemes is important for both L1 speakers' and L2 learners' vocabulary learning (e.g., Goodwin, Petscher, Carlisle, & Mitchell, 2017; Nagy & Anderson, 1984; Zhang & Koda, 2012). Academic language tends to be more difficult to learn than everyday language because the vocabulary used for academic context usually involves low-frequency words, assumed to be learned more slowly than high-frequency ones (Nation, 2013). Moreover, such academic words tend to be complicated in light of morphology (e.g., *photosynthesis*: *photo-* "light" + *-synthesis* "composition") and usually have morphologically related words (e.g., *analyze* [verb], *analysis* [noun]; Goodwin et al., 2017). Thus, analyzing words into morphemes is necessary to understand and learn word meaning, especially in the case of academic vocabulary. Previous studies support this idea. Children whose L1 is English have been found to learn approximately 60% of novel words that they encounter in text by analyzing words into morphemes (Nagy & Anderson, 1984).

Problems in use of morphological information. However, several studies have showed that the use of morphological clues might not always contribute to success in lexical inferencing. For example, a study by Nakagawa (2006) compared morphological and contextual clues in EFL learners' lexical inferencing. Three types of lexical-inferencing tasks (Table 2.1) were used with two participant groups: The first with only the morphological clue, containing the spelling of a target unknown word alone, was presented to one participant group (word-based test [WBT] in Lexical Inference Test I); the second with a contextual clue, where sentences were presented in which the target word was replaced by parentheses, was given to the other participant group (context-

based test [CBT] in Lexical Inference Test I); and the third containing both morphological and contextual clues was provided for both groups (Lexical Inference Test II). The results showed that the morphological clues were effective in inferring not the meanings but the part of speech of the target words, whereas the contextual clues were relatively useful for inferring the meanings of the target words. This seems to correspond to Bensoussan and Laufer's (1984) and Nassaji's (2003) views above, that is, word morphology is frequently used, but would not necessarily be successful.

Table 2.1

Examples of Lexica Inferencing Tests in Nakagawa (2006)

Type of test		Example passage
Lexical Inference Test I	WBT	<u>Recourse</u>
	CBT	The police officer tried to get the demonstrators to stop blocking traffic, but they refused. In the end, the only ( ) was to arrest them.
Lexical Inference Test II		The police officer tried to get the demonstrators to stop blocking traffic, but they refused. In the end, the only <u>recourse</u> was to arrest them.

Note. A target word is underlined, WBT = Word-Based Test, CBT = Context-Based Test.

However, there are several points that should be noted. First, the morphemes of the target words were not fully controlled. For instance, *recourse,* one of the target words used in Nakagawa's study, means something that you do to achieve something or deal with a situation. However, the combination of its morphemes (i.e., *re-*, *course*) is not equal to its whole meaning. Nakagawa's (2006) experiment thus includes words whose

morphological clues are not informative in a way that allows participants to infer their meanings. This might have led to the aforementioned result. Second, participants' responses to the target words suggest that they used the morphological clues to infer the meaning of the target words. Nakagawa reports participants' responses to the target words (e.g., "windless" for *unwind*, "make a barrier in front" for *prevaricated*) that reveal their unsuccessful attempts to infer the target word meanings using the affixes in the words.

To sum up, previous studies examining morphological clues show that L2 learners can process the information of a morphologically complex word, but the degree of morphological processing would be affected by their L2 proficiency. Also, it is suggested that relying too much on in-word morphemes is likely to result in failure in guessing. In addition, past findings on the use of morphological clues toward successful lexical inferencing can be divided into the following positions: (a) The morphological clues can contribute to success in lexical inferencing (de Bot et al., 1997; Haastrup, 1991; Huckin & Bloch, 1993; Zhang & Koda, 2012), and (b) the morphological clues are not necessarily useful to infer the meaning of unknown words (Nakagawa, 2006). This disagreement could be solved if an experimental study took account of whether morphemes in target unknown words are available to participants, or in-word clues are known to learners or not. Thus, there is room for investigation into lexical inferencing in reading using morphological clues, in particular bound morphemes in words.

2.2.3.2 Role of Contextual Clues in Lexical Inferencing

Characteristics of contextual clues. Contextual information, which is another kind of clue used for lexical inferencing, has also been examined (e.g., Hamada, 2013; Nakagawa, 2006; Webb, 2008). As with in-word clues, the usefulness of contextual information also varies. Beck et al. (1983) argued that not all contexts are created equal

by proposing that the informativeness of natural contexts for inferring word meanings would fall along a continuum ranging from *misdirective* contexts to *directive* ones. They describe the graduation of this continuum as follows (Beck et al., 1983, pp. 178–179):

1. *misdirective* contexts, which would direct readers to incorrect word meanings;
2. *nondirective* contexts, which seem to be of no assistance in directing the reader toward any particular meaning for a word;
3. *general* contexts, which seem to provide enough information for the reader to place the word in a general category; and
4. *directive* contexts, which seem likely to lead the readers to a specific, correct meaning for a word.

It should, however, be noted that even misdirective contexts, as Beck et al. (1983) call them, might provide readers with some pieces of information such as word forms (i.e., spelling), grammatical relation to other words, or a situation where the word is used (Nation, 2013). Thus, it is useful to see that every context contains information of some sort regardless of its informativeness.

Merit and problems of making use of contextual information. Past empirical studies have confirmed the above classification proposed by Beck et al. (1983). Nakagawa (2006), as mentioned before, compared contextual clues with morphological ones, showing that context was a good resource for inferring word meaning, whereas morphemes in target words were useful not for guessing word meaning but for identifying word class.

The effect of contextual information has also been shown in studies exploring L2 incidental vocabulary learning from reading. Webb (2008) investigated the relationship

between informativeness of context and success of incidental vocabulary learning among Japanese EFL learners. By using recognition and recall tasks, Webb found that context containing information helpful for inferring target words' meanings helped learners recall more words than the situation in which they were given context without informative clues. Also, Hamada (2011), who investigated the relationship between contextual information and lexical inferencing reported that context quality affects lexical inferencing. Hamada targeted Japanese EFL university students' vocabulary learning from reading and reported that the number of sentences given to learners positively affected the quality of their lexical inferencing and subsequent vocabulary learning through lexical inferencing.

However, note that contextual clues are not always informative for inferring word meaning. As mentioned above, they sometimes mislead learners to a meaning different from the actual meaning of an unknown word (Beck et al., 1983). A study conducted by Ushiro et al. (2013) compared contextual clues with discourse-level clues in Japanese EFL lexical inferencing, revealing the three following points: First, a combination of the two kinds of clues contributed to successful lexical inferencing better than the single use of contextual clues. Second, learners with large L2 depth of L2 vocabulary knowledge used discourse-level clues more than those with the small L2 depth of vocabulary knowledge. Third, learners changed contextual clues that did not function in discourse-based lexical inferencing into effective ones by connecting the contextual clues with available discourse information. This result suggests that contextual clues are not necessarily reliable and the combined use of various clues is better than sole use of contextual information.

To sum up, the arguments and results of previous research tell us that contextual information is basically useful for lexical inferencing. However, its informativeness varies from misdirective to reliable, meaning that contextual information is not

necessarily useful for inferencing. In addition, it is suggested that the combined use of multiple clues would be better than the sole use of contextual information for successful inferencing. These features are aligned with those of morphological clues. Thus, the next section will shed light on combining the use of these two clues for lexical inferencing.

2.2.3.3 Use of Morphological and Contextual Clues in Lexical Inferencing

As the studies reviewed show, both morphological and contextual clues seem to play a part in lexical inferencing. However, when reading text or incidentally learning vocabulary (e.g., extensive reading), there are some possibilities: L2 learners may be provided with both types of clues, either of the two, or none. This is because the two in-text clues are not always available to learners. To make matters worse, these clues may mislead them into incorrectly inferring word meanings. Therefore, examining the combined use of morphological and contextual information in various conditions is necessary to explore authentic lexical inferencing.

One of previous studies suggests informative contextual clues may shape learners' use of morphological clues. Goodwin et al. (2017) proposes that the strategic use of morphemes can be influenced by contextual information. Specifically, the strategic use of morphemes, which they call *strategic morphological analysis*, occurs "in settings that encourage analysis of internal structure of the words, the meanings and grammatical roles of the affixes, and the context in which the word is used" (p. 94), and it "promotes an analytic approach to understand and using words" (p. 94). This notion of strategic morphological analysis suggests that contextual informativeness has an effect on the strategic use of morphemes, although only a few empirical studies have concentrated on the combined used of these two in-text clues

The small number of previous empirical studies examining making combined use

of morphological and contextual clues have revealed that if given both of the available morphological and contextual clues, both L1 and L2 speakers made successful inferences by combining both types of information, but whether they could do this was dependent on their language proficiency.

Making combined use of in-text clues in L1 Lexical Inferencing. A study by Brusnighan and Folk (2012) is one that has investigated L1 incidental vocabulary learning by using morphological clues contained in unknown words and contextual clues surrounding the words. This study comprised two experiments. In the first experiment, they asked native speakers of English to read either context informative (i.e., content of context contributed to successful lexical inferencing) or context neutral (i.e., contextual information did not provide the reader with clues for successful lexical inferencing) content and infer the meaning of target known/unknown compound words using an eye-tracking measurement. The target words were either semantically transparent (e.g., *drinkblend*) or opaque (e.g., *deskdoor*). In the second study, a self-paced reading task and a vocabulary test were assigned to the L1 readers to confirm whether they succeeded in learning target words.

The results of the two experiments revealed that L1 readers processed semantically transparent target words faster in the context informative to infer the meaning of target words than in the context neutral in terms of informativeness. In addition, readers were found to have retained word meaning by paying attention to them only once. Moreover, the results also demonstrated that readers spent more time reading sentences including words that contributed to inferring target words' meanings.

Based on these results, Brusnighan and Folk (2012) argue that good readers automatically analyze unknown compound words into morphemes and that their ability to derive the meanings of whole words from compounds is supported by information of

morphemes and context. They also found the two following points: (a) Readers with high reading proficiency made use of both morphological and contextual clues to infer word meaning, and (b) readers processed target unknown words faster when they were provided with informative context and the words were semantically transparent. These would allow us to assume that if given reliable morphological and contextual clues, readers with high proficiency could infer words' meaning by combining these clues.

Making combined use of in-text clues in L2 Lexical Inferencing. Hamada (2014) investigated the use of both morphological and contextual clues by ESL learners when they could and could not rely on the morphemes in the target compound words to infer the meanings. Hamada identified two conditions in terms of the reliability of morphological clues: the morphologically reliable (MR) condition, where morphological information in target words is reliable to infer word meaning, and the morphologically unreliable (MU) condition, where there are no informative morphological clues in the target words (Table 2.2).

The results of the study can be summarized as follows: (a) There was no significant difference among learners' scores on the lexical-inferencing tasks on the basis of their English proficiency when the free morphemes in the target words were reliable to infer word meaning; (b) learners with lower and intermediate proficiency were prone to depend on morphological clues even when these were not available in the target words, resulting in them failing to infer the meanings of the target words. These results suggest that L2 learners can use morphological clues to infer word meanings when free morphemes in unknown words are available.

Hamada mentioned the following points for future research: First, the informativeness of context in both conditions was not controlled, which might have confounded the interpretation of the simple effects of morphemes on lexical inferencing;

next, because the study used compound words consisting of a free morpheme and a pseudo morpheme, it is necessary to investigate words with derivational affixes, which are assumed to be more complex than compound words.

Table 2.2

Example of Lexical-Inferencing Task in Hamada (2014)

Condition	Experimental sentences and choices
MR	No one had an umbrella. We stood under the rainfime. a. covered tent (meaning based on contextual information) b. rain shelter (meaning based on morphological information, which is supported by context) c. candle light (distracter) d. long grass (distracter) e. I don't know
MU	The student is starting college this semester. She is buying a rainfime. a. new laptop (meaning based on contextual information) b. rain shower (meaning based on morphological information) c. long river (distracter) d. cold mountain (distracter) e. I don't know

Note. A target words are underlined, MR = Morphologically Reliable condition, MU = Morphologically Unreliable condition.

2.2.4 Learners Use of Inferential Strategies

In addition to kind of clues used, the actual strategic use of clues during lexical

inferencing has been observed with the think-aloud method (e.g., de Bot et al., Hu & Nassaji, 2014; Huckin & Bloch, 1993; Nassaji, 2003). The think-aloud method is a popular way of describing a cognitive aspect of reading (Afflerbach, 2000) and a common methodology for research on lexical-inferencing strategies (Nassaji, 2003). When participants engage in a think-aloud study, they are asked to report aloud what they are thinking as they read. The data obtained through the think-aloud method are assumed to reflect the processing in which participants are engaged (Olson, Duffy, & Mack, 1984).

Previous studies on inferential strategies with the think-aloud method have revealed the factors that may help L2 learners succeed in lexical inference. For example, Hu and Nassaji (2014) examined the relationship between inferential strategies used by 11 Chinese ESL learners and their success using a think-aloud method. In their experiment, the inferential strategies that all the participants used were identified, and the participants were divided into two groups: those who were likely to successfully infer word meaning (successful inferencers) and those who were not (unsuccessful inferencers). Their categories and types of inferential strategies are presented in Table 2.3).

The result suggests that there were some differences between successful inferencers and unsuccessful inferencers; these differences involved not only how many times certain strategies were used by inferencers but also when and how they were used. While conducting the experiment, Hu and Nassaji created a scheme based on responses from their participants and previous studies (e.g., Nassaji, 2003) that contains four categories describing the strategic use of clues for lexical inferencing: form-focused, meaning-focused, evaluating, and monitoring categories. For example, the strategies of analyzing and using textual clues, which fall under the form-focused and meaning-focused categories, respectively, are related to the use of morphological and contextual clues in previous studies (e.g., de Bot et al., 1997).

Table 2.3

Categories and Types of Inferential Strategies Created by Hu and Nassaji (2014)

Category	Strategy Type	Definition
Form-Focused	Analyzing	Analyzing a word using knowledge of suffixes, punctuation, or grammar.
	Associating	Attempting to infer the meaning of the TW by associating the word with other similar words.
	Repeating	Repeating the TW or part of the text containing the TW out aloud.
Meaning-Focused	Using textual clues	Guessing the meaning of the TW by using the surrounding context clues.
	Using prior knowledge	Using prior knowledge or experience to infer the word's meaning.
	Paraphrasing	Paraphrasing or translating part of the text that contains the TW.
Evaluating	Making inquiry	Questioning their own inferences.
	Confirm/disconfirming	Confirming or disconfirming the inferences made by using the information in the text.
	Commenting	Making evaluative comments about the TW.
Monitoring	Stating the failure/ difficulty	Making statements about the failure of inferencing or the difficulty of the TW.
	Suspending judgment	Postponing the inference making and leaving it for a later time.
	Reattempting	Discarding the old inferencing and attempting to make a new one.

Note. TW = target word.

Based on the result of their study, Hu and Nassaji suggest the characteristics of successful inferencers: Successful inferencers tended to (a) show frequent use of

evaluation and monitoring strategies, (b) use a combination of contextual and background knowledge, and (c) conduct self-awareness and reattempt to infer the meaning of target words.

2.2.5 Effects of Learner Proficiency on Lexical Inferencing

The previous section presented an overview of the literature on the use of morphological and contextual clues in unknown words and its effect on learners' success in lexical inferencing. This section will consider previous research on the relationship between the use of morphological and contextual clues and learners' proficiency in lexical inferencing.

Previous studies have shown that there are significant connections between the use of morphological clues and learners' vocabulary size. For instance, Mochizuki and Aizawa (2000) revealed that EFL learners' vocabulary size and affix knowledge have a positive correlation. In their study, Mochizuki and Aizawa implemented the vocabulary-size test and affix-knowledge test created by the authors to measure participants' vocabulary size and affix knowledge and examined their relationship. The affix test they used comprised multiple-choice questions with four choices, from which the participants were instructed to choose the correct one corresponding to the meaning of the target affix (prefix or suffix), which was accompanied by three pseudo words (Table 2.4).

The results of the study showed that there were correlations (a) between learners' vocabulary size and prefix knowledge (r = 0.58) and (b) between their vocabulary size and suffix knowledge (r = 0.54). In other words, it was revealed that learners with large vocabulary size knew more English affixes than ones with a small amount of vocabulary. This result may not be surprising because it has been reported that morphological clues in new words are used in learning by both L1 speakers (Brusnighan & Folk, 2012) and

L2 learners (Paribakht & Wesche, 1999). It should be noted that the type of participants' affix knowledge that Mochizuki and Aizawa measured was receptive knowledge. It is thus unclear if participants can ascertain the meanings of affixes when they are presented solely. Moreover, this study did not address the relation between lexical inferencing with morphological clues and learners' vocabulary size.

Table 2.4

Example of the Affix Knowledge Test Used in Mochizuki and Aizawa (2000)

Target affix	Question items and choices
Prefix	antislimad antikiofic antirachy
	(1) human (2) of antenna (3) opposed (4) ancient
Suffix	romborta<u>ble</u> quifa<u>ble</u> slomita<u>ble</u>
	1. noun 2. verb 3. adjective 4. adverb

Note. Target affixes are underlined, directions and choices were originally given in Japanese.

Zhang and Koda (2012), as mentioned previously, investigated such relation within a framework of structural equation modeling, focusing on "the ability to analyze multimorphemic English words appropriately into their morphological units and correctly identify the root on which the meaning of each target word was based" (p. 1201), or morphological awareness. They examined whether Chinese EFL learners' morphological awareness contributed to their L2 vocabulary knowledge (the size and depth of vocabulary) and reading proficiency directly and indirectly through the mediation of lexical inferencing ability. The results of the study demonstrated the following points: (a) Chinese EFL learners' morphological awareness directly contributed to vocabulary

knowledge, and (b) Chinese EFL learners' morphological awareness contributed to vocabulary knowledge indirectly through the mediation of lexical inferencing ability. In their discussion, Zhang and Koda argued that analyzing words into morphemes (e.g., affix, base) helps L2 learners' lexical inferencing, which is the reason for the indirect contribution of morphological awareness to vocabulary knowledge through lexical inferencing ability.

Putting these studies together allows us to make the following suppositions. Because it was found that (a) there is a positive relation between learners' vocabulary size and affix knowledge and (b) learners' ability to analyze words into morphemes contributes to vocabulary knowledge through lexical inferencing ability, it is probable that learners gain skills to break down words into morphological units and integrate their meanings as they increase their vocabulary knowledge, resulting in incidental gain in affix knowledge. Thus, it is possible that learners with a larger vocabulary size succeed in lexical inferencing with morphological clues.

Regarding the use of contextual clues, L2 reading proficiency seems to be key. This is because reading ability is required to understand contextual information. Previous studies support this. Nakagawa (2006), who compared the use of morphological and contextual clues in L2 lexical inferencing revealed the contribution of L2 reading proficiency to successful lexical inferencing. Another previous study (Hamada, 2013) has also revealed the role of contextual constraint in L2 lexical inferencing. Hamada compared the difference between context that constrained the inferable meaning of unknown words and context that did not. The result revealed that (a) Japanese EFL learners with high L2 reading proficiency, which was measured by the EIKEN test, activated target words' accurate meanings, while those with low reading proficiency did not; and (b) learners activated the general meanings of target words across L2 reading-

proficiency levels under the circumstance where the context did not constrain words' meanings. This suggests that contextual clues can be used by L2 learners irrespective of their L2 reading proficiency. Hamada (2014) investigated the relationship between the use of morphological and of contextual clues by learners with different levels of L2 general proficiency and found that learners' use of contextual clues possibly depends on their L2 proficiency. Note that the L2 proficiency reported in Hamada (2014) was measured by an ESL test from the ACT Compass. Unfortunately, the content of the test was not reported.

To sum up, both L1 and L2 studies on the relationship between reading proficiency and use of contextual clues suggest that readers with high reading proficiency benefit from contextual information whereas those with low proficiency do not (Brusnighan & Folk, 2012; Nakagawa, 2006). However, it was reported that L2 learners were able to infer rough meanings of target words regardless of differences in L2 reading proficiency (Hamada, 2013). Also, Hamada (2014) revealed that the use of contextual clues depended on learners' language proficiency, but the specific constructs of the learners' language proficiency test reported were not clear. Thus, whether L2 reading proficiency does indeed affect success in L2 lexical inferencing needs to be examined.

2.3 Vocabulary Learning Through Lexical Inferencing

2.3.1 Theoretical Explanations

As mentioned above, according to the LQH of Perfetti and Hart (2002) and the elaborated version of the LQH for L2 (Nation, 2013), successful lexical inferencing is key to learning vocabulary from reading. An important assumption underlying the LQH is that processing additional input through text comprehension leads to an increase in vocabulary knowledge, and lexical inferencing serves to mediate between these two

phenomena (Nation, 2013). This theoretical explanation of incidental vocabulary learning in both L1 and L2 highlights the importance of being able to effectively infer word meanings from text.

However, previous studies of L2 vocabulary learning also suggest that success in making informed guesses about word meanings does not necessarily lead to the retention of inferred word meanings. Laufer (2003) criticized some aspects of incidental vocabulary learning through lexical inferencing based on the following four assumptions: (a) the noticing assumption: Learners usually do not recognize unfamiliar words as being unfamiliar; (b) the guessability assumption: Context, including unknown words, sometimes lack the necessary information for inferring word meanings, or even mislead learners to inferring different meanings from the correct ones. This notion is aligned with findings from past research (Beck et al., 1983); (c) the guessing-retention link assumption: Incorrect guessing does not count as learning. This contention is supported by Haastrup (1991), who empirically examined how easy and successful guessing can lead to a lower retention of inferred word meanings; (d) the cumulative gain assumption: Although Laufer found that repeated encounters with a target word would lead to its retention, she doubted the effectiveness of learning vocabulary from reading. This is because a target word may not necessarily appear frequently in a text.

Although the four assumptions above are not empirically examined in Laufer's work (2003), theoretical explanations on word learning support them. Craik and Lockhart (1972) suggest that the depth of the processing hypothesis, the degree to which a learner engages in processing words, affects the subsequent retention of those words. Based on this idea, past studies have tried to identify the kind of factors that result in the deep lexical processing. One such example is Laufer and Hulstijn's (2001) involvement load hypothesis. They proposed the following: (a) Involvement loads are determined by the

combination of three dimensions: *need* (i.e., whether the word is required for the completion of a given task), *search* (i.e., the existence of processing information, such as a word's form and meaning), and *evaluation* (i.e., making decisions about a word meaning); (b) the higher the involvement load required to process a given word, the more likely a learner is to retain the word's meaning; and (c) the higher the involvement load required by a task, the more a learner retains the word's meaning.

Based on the notion of the involvement load hypothesis, past research has attempted to explain the effectiveness of tasks for vocabulary learning, including lexical inferencing. Kim (2011), for example, explained why consulting dictionaries during reading was more effective than guessing word meanings for vocabulary learning in the study by Cho and Krashen (1994). Kim assumed that learners' use of dictionaries at their own volition requires use of all three dimensions of involvement loads, whereas guessing word meanings only involved need and search; hence, using a dictionary in vocabulary learning is considered a better option. However, it should be noted that evaluating which dimension of involvement load a certain task depends primarily on researchers' subjective judgments.

The idea of the involvement load hypothesis implies that guessing word meanings is less effective in terms of word learning. However, findings from previous studies suggest the possibility that using morphological and contextual clues would improve learner retention under certain conditions. The coming sections will review studies that investigate vocabulary learning through lexical inferencing using morphological and contextual clues.

2.3.2 The Effect of Morphological Information on Incidental Vocabulary Learning

Use of morphological clues in a target word is one of the resources through which L2 learners gain vocabulary knowledge through inferring word meaning. Past research on L1 acquisition showed that L1 children learn about 60% of vocabulary by deconstructing words they encountered into word parts (Nagy & Anderson, 1984). This study suggested that it was common for L1 children to learn vocabulary through lexical inferencing based on morphological clues. In addition, McCutchen and Logan (2011) investigated how the morphological awareness of L1 students in fifth and eighth grades would affect their inferring of word meanings and L1 proficiency in vocabulary and reading. As a result, L1 students have an ability to infer word meanings using morphological analysis, and their morphological awareness accounts for their vocabulary and reading proficiency.

As with L1 vocabulary learning, attention to forms when learning new L2 words is also considered important, since knowledge on wordforms encourages learners to gain new vocabulary (Schmitt, 2008). An empirical study by Zhang and Koda (2012) showed that the use of morphological clues indirectly contributed to vocabulary knowledge and reading comprehension through an increased ability in lexical inferencing. This result suggests that using morphological clues when inferring word meanings can be effective for their retention. However, this possibility still requires further research, because Zhang and Koda did not observe participants' retention of individual items inferred during lexical inferencing tests.

2.3.3 The Effect of Contextual Information on Incidental Vocabulary Learning

Another factor in vocabulary learning through lexical inferencing is frequency, or how many times L2 learners encounter a certain word during reading. An investigation

by Waring and Takaki (2003), for example, revealed that novel words seen less than 15 times during reading were rarely recalled by EFL learners. However, the effectiveness of learning vocabulary from texts is affected by the quality of their context. For example, Webb (2008) conducted an experiment in which Japanese EFL university students inferred meanings of target pseudo words in context under four different conditions and were later asked to recall word meaning. These conditions differed in the degree to which context contained information which was helpful for lexical inferencing (informativeness). The results showed that the context informativeness positively affected retention of word meaning; scores for meaning recognition and recall tasks were significantly higher in informative context conditions than in less informative conditions. Note that even though Webb's results showed significant differences between more and less informative conditions, the degree of retention was not high. Specifically, the score on recall of meaning was 1.31 out of 10 in the more informative condition, and that in the less informative condition was 0.13 out of 10. These results indicate that retention of inferred word meaning can occur, but its learning efficiency is not necessarily high.

2.3.4 The Effect of the Combined Use of Morphological and Contextual Information on Incidental Vocabulary Learning

The studies above show that the use of morphological and contextual clues during lexical inferencing can lead to better retention of inferred word meanings under certain conditions. However, regarding the effect of the combined use of both in-text clues on vocabulary learning, two opposing theoretical explanations have been proposed by existing L2 research suggest. According to Bolger, Balass, Landen, and Perfetti's (2008) instance-based framework of word learning, contextually encountering a novel word leaves a memory trace of the word, as well as its context. Some aspects of this trace will

be reinforced as the word is encountered in various contexts, whereas others will be weakened. This theory suggests that the context in which an unknown word is introduced may possibly help learners retain its meaning, by acting as a clue for future recall.

In terms of the cognitive burden, however, paying attention to wordform may not always be effective in L2 vocabulary learning. Barcroft (2002) compared the effects of three different tasks on the learning of novel words with their corresponding pictures: semantic elaboration (i.e., rating how pleasant each item with a picture is), structural elaboration (i.e., counting the number of letters in each word), and simply making efforts to memorize items (no elaboration). The results showed that L2 learners of Spanish recalled fewer items in a free-recall test under the semantic-elaboration condition than in the structural one; in contrast, there was no significant difference in the scores of a cued-recall test (producing Spanish words based on pictures only) between semantic and structural elaborations.

Based on this result, Barcroft argued that semantic elaboration may inhibit wordform learning and memory for words themselves, because of learners' limited processing capacities. This interpretation is derived from Barcroft's (2000; as cited in Barcroft, 2002) type of processing-resource allocation (TOPRA) model, which assumes that when processing demands are sufficiently high, semantic elaboration facilitates learning the semantic properties of words, while inhibiting the learning of words' structural properties and vice versa. In his discussion, Barcroft (2002) stated that the reason for the result could be that the participants under the semantic elaboration condition could not allot their processing resources to the wordform of the target items.

To sum up, the theoretical explanations on vocabulary learning using morphological and contextual resources leave room to examine whether the combined use of both in-text clues during inferencing has a positive effect on vocabulary learning.

To be more specific, contextual information that includes an unknown word could serve as a clue to recall the word's meaning (Bolgar et al., 2008), whereas focusing on specific aspects of the word, such as its meaning or its spelling, may inhibit learners from memorizing other aspects on account of their limited processing capacities (Barcroft, 2002).

2.3.5 Predictions on Vocabulary Learning Through Lexical Inferencing

Previous studies have argued that guessing word meanings is a good resource for vocabulary learning (e.g., Nation, 2013) and revealed that the use of morphological (e.g., Zhang & Koda, 2012) and contextual clues (e.g., Nakagawa, 2006), a combination of both (e.g., Hamada, 2014), and learners' L2 proficiency (e.g., Hamada, 2014) are key to inferring word meaning. However, in terms of involvement load (Laufer & Hulstijn, 2001), lexical inferencing may not have an effect on L2 vocabulary learning because guessing word meanings is assumed to be a low-burden task (Kim, 2011). Moreover, because learners' capacities for processing a word's form and meaning are limited (Barcroft, 2000), the combined use of morphological and contextual clues may not be helpful in retaining inferred word meanings. On the other hand, it has also been suggested that contextual information, which includes an unknown word, could serve as a clue to recall the word's meaning in the future, according to Bolgar et al.'s (2008) explanation of learning vocabulary.

These findings and theories based on previous studies regarding L2 vocabulary learning through lexical inferencing based on morphological and contextual clues would suggest the following contradictory predictions. First, if L2 learners are given the two types of clues available to them (morphological and contextual), it will be easier to infer word meaning than without any informative clues, leading to the facilitation of incidental

vocabulary learning. This prediction is based on the fact that context informativeness positively affects retention of word meaning (Webb, 2008) and that an indirect contribution of the use of morphological clues for vocabulary knowledge and reading comprehension through lexical inferencing ability (Zhang & Koda, 2012). However, retention of inferred word meaning based on morphological and contextual clues has not been examined in detail.

The second prediction is as follows: When both morphological and contextual clues are available to L2 learners, it will be easier for them to infer word meaning, but they may pay less attention to unknown words, resulting in more difficult retention of inferred word meaning because of insufficient involvement load. This prediction is formed based on arguments provided by research on L2 vocabulary learning and lexical inferencing (e.g., Haastrup, 1991; Laufer, 2003; Laufer & Hulstijn, 2001). For example, Haastrup (1991) showed that easily inferred word meaning is not easily retained. Also, Laufer (2003) argues that learning that requires a great deal of effort leads to reinforcement of memory, whereas learning that demands little effort does not.

Though both of these predictions could add important knowledge to the field, little research thus far has focused on the relationship between morphological and contextual clues and vocabulary learning through lexical inferencing.

Chapter 3

Present Study

3.1 Summary and Limitations of the Previous Findings

Learning vocabulary from text requires L2 learners to make successful inferences on word meanings. In lexical inferencing, learners make combined use of clues available in text such as morphology in unknown words and contextual information surrounding words. However, these two in-text clues are not always helpful; they confuse learners. Regarding morphology, learners tend to use in-word clues better than contextual ones (Nassaji, 2003); however, there are some words whose morphemes do not correspond to their whole meanings, for example, on the evidence of a pair of *canny* and *uncanny*. Contextual clues also vary between directive information to misdirective information (Beck et al., 1983). Moreover, whether learners infer word meanings by combining these in-text clues depends on their L2 proficiency, mostly when in-word clues were unreliable and contextual information was reliable (Hamada, 2014).

These difficulties in lexical inferencing would also affect the following retention of inferred word meanings because success in making guesses on word meanings is a prerequisite for subsequent learning of the inferred word meanings (Nation & Webb, 2011). However, some researchers have argued that robust retention could not be achieved unless a learner engages in processing target words to a sufficient extent in depth when learning them (e.g., Hulstijn & Laufer, 2001). That is, was suggested that easily inferred word meanings are not necessarily easily retained (Haastrup, 1991). Few studies have focused on the relation between lexical inferencing by combining morphological and contextual clues and subsequent retention of inferred word meanings.

Altogether, there is a need to investigate how lexical inferencing using

morphological and contextual clues would affect subsequent retention of inferred word meanings.

3.2 Purpose, Overview, and Concerns of the Present Study

3.2.1 General and Specific Purposes

This study aims to explore the relationship among (a) morphological and (b) contextual clues in texts, (c) learner proficiency, especially vocabulary size and reading proficiency, (d) lexical inferencing, and (e) subsequent vocabulary learning. In assessing this relationship, I conducted two subordinate empirical studies corresponding to the two following purposes: an investigation on how success in lexical inferencing would be affected by the availability of morphological and contextual clues, learner proficiency (Study 1), and how this relationship would affect subsequent vocabulary retention (Study 2). In addressing these purposes, I carried out five experiments on EFL learners at a university in Japan; three experiments are for Study 1 (Experiments 1–3) and the other two for Study 2 (Experiments 4 and 5).

3.2.2 Individual Purposes and Overview of the Five Experiments

The individual purposes and overview of Experiment 1–5 in Studies 1 and 2 are as follows:

Study 1, described in Chapter 4, began with Experiment 1, which aimed to investigate the effects of morphological clues, in particular prefix information in target words and L2 vocabulary size on EFL lexical inferencing. In this experiment, a total of 35 Japanese EFL undergraduate and graduate students inferred the meaning of 22 target words with prefixes that were either available/unavailable to participants (prefix availability). All target words were presented in sentences that were not sufficiently

informative to allow participants to infer the meaning. The prefix availability and sentences containing target words were examined and created through two norming studies.

Experiment 2 examined the effects of L2 reading proficiency, prefixes, and contextual information on EFL lexical inferencing, focusing on strategies to be used during inferencing. In this experiment, EFL university students engaged in a lexical-inferencing task consisting of 2 (prefix availability: +prefix/–prefix) × 2 (context: +informative/–informative) conditions and an L2 reading-proficiency test. During this think-aloud study, participants reported what they were thinking as they inferred a word's meaning.

Experiment 3 investigated the relationship between the use of clues and learner factors and difficulty faced by EFL learners in lexical inferencing. In addition, this experiment explored the possibility of a simple paper-based task for observing the process participants engage in during lexical inferencing by analyzing the patterns of participants' choice selection.

Study 2, discussed in Chapter 5, consists of Experiments 4 and 5. Based on the results of previous studies, both experiments investigated how lexical inferencing using in-text clues affected subsequent vocabulary retention, focusing on prefix availability, contextual informativeness, and learners' vocabulary size and reading proficiency. In these experiments, EFL university students completed two tests of vocabulary and reading proficiency and a paper-based lexical-inferencing task. After one week, the participants were asked to recall the inferred meanings. These two experiments differed in the recall task and procedure so as to eliminate the possibility that participants instantaneously inferred the meaning based on in-word clues while working on the test, and to determine

the effect on subsequent vocabulary learning of an intervention in which learners look up word meanings after inferencing (Mondria, 2003).

3.2.3 Concerns of the Present Study

This section discusses concerns considered in the five experiments mentioned above based on the findings and the limitations of previous studies. Detailed explanations of each material and procedure addressed here are provided in the subsequent chapters.

3.2.3.1 Target words

In all five experiments, the present study primarily focused on target items, English words that consist of prefixes and single free morphemes as their root woods (e.g., *unrest* → *un-* and *rest*). The reasons for this are as follows: First, among affixes, most prefixes add additional meaning to the base of a word, except for a few such as *en-* (a prefix that changes a noun or an adjective into a verb; e.g., *en-* + *dear* → *endear*). Whereas suffixes mainly function as morphemes that change the word's part of speech, such as *-ence* in *inference* (i.e., derivational affixes) or as one that reflects the word's inflection such as *-s* in *words*. Some suffixes indeed play a role in adding additional meaning, such as *-er* in *-learner,* which adds the meaning of an agent of what the suffixed verb indicates. However, this study is concerned with inferring word meanings rather than identifying a word's part of speech. Therefore, it is reasonable to focus on learners' use of prefixes more than suffixes in lexical inferencing.

Second, according to previous studies that compared the use of morphological and contextual clues in words (Hamada, 2014), L2 learners can use free morphemes, or only non-affixes words, in compound words for inferencing, although Hamada's target words were pseudo compounds (see Figure 2.3 for more detail). Additionally, the past research

on L2 morphological analysis (Morita, 2010; Silva & Clahsen, 2008) suggests that L2 learners could decompose words into their roots and suffixes. Nonetheless, there is a need to examine whether they could identify and use in-word prefix information for inferencing.

Third, past findings on the use of morphological clues toward successful lexical inferencing show that it can be divided into the following positions: (a) The morphological clues can contribute to success in lexical inferencing (de Bot et al., 1997; Haastrup, 1991; Huckin & Bloch, 1993; Zhang & Koda, 2012), and (b) the morphological clues are not necessarily useful in inferring the meaning of unknown words (Nakagawa, 2006). This disagreement could be solved if an experimental study takes account of whether morphemes in the target unfamiliar words are available to participants or in-word clues are known to learners or not.

The last point of concerns was whether to use existing words or pseudo ones for this study. It is not unusual for researchers to use pseudo words (e.g., Hamada, 2014; Webb, 2008). Aiming to examine the retention of inferred words, Webb (2008) used pseudo words to ensure participants did not know any of the target words, which helped in the clear interpretation of the results. Though pseudo words help researchers obtain more precise results than real words, using pseudo words is not always the best way for studying L2 processing and learning. One of the reasons is that it is pointless to use pseudo words for L2 learners participating in an experiment and it also wastes their time and effort being spent on learning L2 (Nation & Webb, 2011). As this dissertation aimed to reveal the mechanism of word-meaning inference and learning in L2 through morphological and contextual clues, using pseudo words alone was not deemed a good method for the present study. For this reason, both pseudo and existing words were used: Pseudo words to measure participants' knowledge of prefixes within target words (for

more detail, see the coming chapter), and existing words to observe actual inference and retention of meaning. A target word consists of the prefix selected through the norming study (see Section 4.1.2.1) and a noun that is below Level 5 of the *Japan Association of College English Teachers (JACET) 8000 vocabulary list* (Ishikawa et al., 2003) or assumed to be known to the group of participants (i.e., Japanese undergraduate and graduate students). JACET 8000 is a corpus-based list, which contains English words varying at different levels of 1,000 words in terms of the frequency in which an EFL university student would encounter the words.

3.2.3.2 Passages

Informativeness of context in this study refers to the degree to which the context of the passage contributes to inferring the target word's meaning (cf. Beck et al., 1983). Concerning past research that examined the effect of contextual information on lexical inferencing (Hamada, 2014) and subsequent learning (Webb, 2008) above, I created passages for each target word based on the following criteria: (a) Each passage consisted of one or two sentences, (b) the length of each passage was limited to a maximum of 25 words, and (c) the words in the passages were adjusted to the level of the participants in the experiments (i.e., EFL university students in Japan).

Contrary to Hamada (2014) and Webb (2008), I had the informativeness of the experimental passages assessed by EFL students at the university, majoring in English language education, rather than L1 speakers of English. This was done to avoid the possibility that participants in this study (i.e., EFL students in Japan) would recognize the informativeness of context and that L1 speakers of English might differ because of their English-language proficiency. A detailed description of the contextual informativeness in this study is given in Experiments 1 and 2 in the next chapter.

3.2.3.3 Lexical-Inferencing Task

I created three lexical-inferencing tasks with the target words, and the passages selected based on the criteria mentioned above. In this study, EFL students inferred the meanings of 22 words that contained both known and unknown prefixes (prefix availability) that existed in sentences with varying levels of informative context (contextual informativeness) in a lexical-inferencing task. However, the task conducted in Experiment 1 was only involved in two prefix conditions.

The other differences were as follows: In Experiment 2, EFL university students reported their thoughts as they inferred the meaning of a word presented on the PC screen (i.e., a think-aloud method); the inferencing task in Experiments 1, 4, and 5 was in a free-descriptive paper-and-pencil form, whereas the task in Experiment 3 related to a paper-based multiple-choice version. These differences were intended to correspond to the research purpose in each experiment presented above.

3.2.3.4 Learning-Confirmation Test

To reveal the effect of lexical inferencing using morphological and contextual clues, I created two different versions of a learning-confirmation test. These two tests differ in terms of clues that EFL students could use to recall inferred word meanings: The recall test in Experiment 4 presented the spelling of a target word to participants, but in Experiment 5 an experimental passage had the target word replaced with parentheses. Therefore, participants had to recall the meanings of the target words based on the context sentences. As mentioned above, this difference was meant to avert the possibility of the participants recognizing the inferred word and instantaneously inferring the meaning based on in-word clues while working on the test.

3.2.3.5 Assessment of L2 Proficiency and Prefix Knowledge

Vocabulary size. Past literature suggests that the vocabulary size of L2 learners is vital for lexical inferencing based on the following points: vocabulary size generally indicates how much a learner has spent on learning L2 (Nation, 2013). Thus it can be a sound indicator of their general L2 proficiency. Further, past L2 research has revealed that vocabulary size and morphological awareness (the ability to decompose a word into its morphemes and reflect on its whole meaning) are related. The learners' morphological understanding indirectly contributes to their L2 vocabulary and reading proficiency mediated by their lexical-inferencing ability (Zhang & Koda, 2012). Learners' knowledge of L2 affixes was correlative with their L2 vocabulary size (Mochizuki & Aizawa, 2000).

To measure their participant's vocabulary size, Mochizuki and Aizawa used the Mochizuki Vocabulary Size. This paper-and-pencil vocabulary-size test was developed for Japanese EFL learners and can measure a test taker's vocabulary size to a maximum of 7,000 words. Thus, the present study also adopted the revised Mochizuki Vocabulary-Size Test in Aizawa and Mochizuki (2010) for all of the experiments except for Experiment 2, where participant's vocabulary size was considered as a factor.

Reading Proficiency. Previous studies have also shown the importance of reading proficiency for lexical inferencing (e.g., Nakagawa, 2006). However, this less important because understanding a text or sentence is essential for learners to make informed guesses on the meaning of an unknown word from its surrounding information (i.e., contextual clues). Therefore, the present study also considered the effect of reading proficiency in lexical inferencing based on in-text clues and subsequent learning.

To assess participant's L2 proficiency, I created a reading test that consisted of items extracted from old versions of the reading section of EIKEN tests. The following

were the reasons behind the use of EIKEN tests. First, the EIKEN test is one of the most widely used standardized English tests in Japan; thus, its test style is familiar to university students in Japan. Second, the EIKEN tests are classified into seven grades in terms of difficulty, ranging from Grades 5 to 1. This feature is useful in creating a test that corresponds to test-takers' English proficiency.

Prefix Knowledge. As stated above, Mochizuki and Aizawa (2000) revealed that learners' knowledge of L2 affixes correlates with their L2 vocabulary size. The affix knowledge that Mochizuki and Aizawa measured, however, was receptive. Therefore, it is unclear whether participants can ascertain the meanings of affixes when presented without any support.

Based on the format used in Mochizuki and Aizawa's (2000) affix test, I created a prefix text, where three words that consisted of a prefix and a pseudo base were presented to participants per prefix. The prefixes in the three pseudo words were underlined, and participants were asked to write down their meanings in Japanese. This way, the participants' productive knowledge of the prefixes was measured, ensuring their recall of the prefix meanings without any support.

3.2.3.6 Post-Task Intervention

Past literature (Mondria, 2003) showed that post-inferential activities such as consulting a dictionary helped learners to increase their vocabulary knowledge more than nothing given to them after inferencing. This result clarified the possibility of an educational intervention by L2 educators who aim to improve their students' efficacy in learning vocabulary from the context. There is a need to investigate how this post-inferential invention would affect learning vocabulary from lexical inferencing based on

in-text clues to obtain further implication on the effectiveness of post-task activity in the classroom.

Thus, Experiment 5 attempted to reveal the effect of an intervention in which learners check word meaning after inferencing on subsequent vocabulary learning. In Mondria (2003), participants checked target words in a dictionary, but this was not done in this research because it was unrealistic to provide participants with the same dictionaries during the class period. Therefore, instead of using a dictionary, I gave a list of target word meanings to the participants in the experiment group, while those in a control group did not receive the list. The list contained the target words in English alongside Japanese.

Chapter 4

Study 1: Use of Morphological and Contextual Information in Japanese EFL Lexical Inferencing

As stated in Chapter 3, Study 1 aimed to investigate EFL learners' lexical inferencing in reading from the perspective of prefix availability, contextual informativeness, and learners' L2 vocabulary size and reading proficiency.

To this end, three experiments were conducted in Study 1. First, the relationship among prefix availability (knowing the meaning of the prefix within a target word), learners' vocabulary size, and the degree of success in lexical inferencing was examined (Experiment 1). The next experiment investigated whether prefix availability, contextual informativeness (the degree to which the context of the experimental passage contributes to inferring the target word's meaning), and learners' reading proficiency affect lexical inferencing (Experiment 2). The participants were asked to report aloud what they were thinking as they inferred a word's meaning (think-aloud method), and their verbal protocols were analyzed to grasp tendency of inferential strategy use. Lastly, relationship between the use of morphological and contextual clues and learners' English proficiency (i.e., vocabulary size and reading proficiency) was analyzed through a paper-and-pencil multiple-choice lexical-inferencing task (Experiment 3). The following section describes the purpose, methods, and results of the three experiments.

4.1 Experiment 1: Effects of Prefix Availability and Vocabulary Size on Japanese EFL Lexical Inferencing

4.1.1 Purpose, Overview, and Research Questions of Experiment 1

This experiment aimed to examine whether prefix availability, learners' vocabulary size, and the degree of success in lexical inferencing were related to each other. The findings of past studies on the use of morphological information and its contribution to successful lexical inferencing can be summarized as follows: Use of morphology to infer a word's meaning is the second most frequently used lexical-inferencing strategy (Nassaji, 2003). Yet, there has been disagreement among researchers about the contribution of morphology to successful inferencing. For example, Nakagawa (2006) argues that a morphological clue within a target word is less effective in inferencing than a contextual one, showing participants' misuse of morphological knowledge for inferencing. By contrast, a SEM study demonstrated the importance of being able to decompose a target word into morphemes to infer its meaning (Zhang & Koda, 2012).

This disagreement can be attributed to the following methodological reasons: first, participants' morphological knowledge of the target words was not taken into consideration. For instance, Nakagawa (2006) reported that one of the participants in her study guessed the meaning of the word *unwind* as windless. It is likely that this participant did not know that the root of the word *unwind* was the verb *wind* (phonetically /waɪnd/), not the noun *wind* (/wɪnd/). Still, this example suggests that the participant knew the prefix *un-* meant opposite or reverse and could use this knowledge to guess the meaning of *unwind* (e.g., *-less* in *windless*). For more precise understanding of lexical inferencing, it is necessary to differentiate between cases where a learner fails to infer the meaning of a word because of a lack of morphological knowledge from those where a learner fails despite knowing the word's morpheme(s). Since the main aim of Experiment 1 was to

examine the relationship between the use of morphological clues in unknown words and successful inferencing, I distinguished a condition where a participant knew the morphology of the target words and otherwise.

Another possible reason for the disaccord could be the confusion regarding the meaning of morphemes in the target words. Some studies controlled target words' morphology (e.g., Hamada, 2014), while others did not (e.g., Nassaji, 2003). Further, studies investigating the role of morphological clues in lexical inferencing focused on different kinds of morphemes such as free morphemes (e.g., Hamada, 2014) and bound morphemes (Nakagawa, 2006; Nassaji, 2003) and reported different results. Hamada (2014) demonstrated the effect of ESL learners' general English proficiency on their selection of morphemes of target words (compound words of two free morphemes) or the contextual information that they used to infer the meaning. As to the latter (bound morphemes), few studies discussed the relationship between morphology use and learner factors, although learners' L2 lexical development is reported to be relevant to morphological knowledge (Mochizuki & Aizawa, 2000). Note that Nakagawa (2006) discussed the effect of morphological information and reading proficiency on successful inferencing, but did not address their interaction. To discuss in detail the effect of morphology on lexical inferencing, this experiment focused on the relationship between bound morphemes in target words and learners' vocabulary size.

Taking these methodological factors into consideration, I conducted two norming studies (Norming Studies 1 and 2) and one main experiment within Experiment 1. The two norming studies were administered for selecting target words and creating sentences as material for the main experiment, which was conducted to meet the aims of the present experimental study. To achieve the purpose of Experiment 1, the following two research questions (RQs) were posed.

RQ 1-1: Does the availability of a prefix clue in an unknown word contribute to successful lexical inferencing by EFL learners?

RQ 1-2: Does the effect of the availability of a prefix clue in an unknown word on lexical inferencing by EFL learners differ with respect to their vocabulary size?

4.1.2 Method

4.1.2.1 Norming Study 1: Selection of Available/Unavailable Prefixes

Purpose. The purpose of the first norming study was to select target words for the material of the main experiment. Prefixes in the target words were divided into two types in terms of their availability: Ones that participants can use, as they know their meanings (prefix-available condition) and ones that participants cannot use, as they do not know their meanings (prefix-unavailable condition).

Participants. The participants in Norming Study 1 were 10 Japanese undergraduate and graduate students. Their majors varied, such as humanities, engineering, social studies, education, and Japanese language and culture.

Material. A prefix test was created to judge what kind of prefixes participants were able to use and not use. This test included 29 prefixes (*anti-*, *ante-*, *arch-*, *bi-*, *circum-*, *counter-*, *ex-*, *fore-*, *hyper-*, *inter-*, *mid-*, *mis-*, *neo-*, *post-*, *pro-*, *semi-*, *sub-*, *un-*, *pre-*, *re-*, *ab-*, *ad-*, *com-*, *de-*, *dis-*, *ob-*, *per-*, *trans-*, *non-*). They were extracted from Nation's (2013, p. 395) *sequenced list of derivational affixes for learners of English*. Based on the format used in Mochizuki and Aizawa's (2000) affix test, three words that consisted of a prefix and a pseudo base were presented to participants per prefix. The prefixes in the three pseudo words were underlined (Figure 4.1; see Appendix A for the whole items).

1. antiphlonnth antiwomped antisikced

下線を引いた部分の意味を下の欄に日本語で記入してください。
意味：

Figure 4.1. Example of the prefix test in Norming Study 1. The direction written in Japanese translates as follows: Write down the meaning of the underlined parts in the blank space below in Japanese.

Procedure. Participants were asked to write down their meanings in Japanese. In doing so, the participants' reproductive knowledge of the prefixes was measured, ensuring their recall of the prefix meanings without any support. The participants were instructed to write the meaning of the underlined prefix common to the three words. They were allowed to leave the item unfilled if they did not know the prefix in question. This was because the purpose of this test was to analyze participants' knowledge of the target prefixes; therefore, it was necessary to prevent them from making random guesses. Further, the participants were asked to write down at most three meanings of the prefixes if they recalled more than one meaning. Some of the target prefixes were polysemous (e.g., the prefix *ex-* means both "out" and "former"); therefore, asking the participants to write down only one possible meaning could have resulted in a situation where the participants wrote a meaning different from the target meaning of the prefix.

Scoring and Results. With reference to previous studies' (Nassaji, 2003; Ushiro et al., 2013) criteria, participant responses to the prefix test were rated on the basis of a three-point scale (0: *unsuccessful*, 1: *partially successful*, 2: *successful*). *Successful* meant that responses completely accorded with the meaning of the prefix, *partially successful* meant that they were not totally equal to but related to the meaning of the prefix, and *unsuccessful* meant that they had nothing to do with the meaning of the prefix (Table 4.1).

The scoring began with the rating of 30% of all responses by a graduate student majoring in English language education and me.

Table 4.1

Example of Scoring for the Prefix Test in Norming Study 1 for ex-

Score	Scale	Examples
2	Successful	*sotoni* (“out”)
1	Partially successful	*reigai* (“exception”)
0	Unsuccessful	*tairyono* (“vast”), *yokoni hirogaru* (“widen”)

The inter-rater agreement was 87.36%, $\kappa = .778$, $p < .001$, and discrepancies were resolved through discussion between the raters. Finally, the rest of the responses were rated by the same raters. Based on the result, 11 prefixes with higher marks were chosen as the prefixes in the available condition (+ prefix), and 11 prefixes with lower marks were selected as the prefixes in the unavailable condition (– prefix). Table 4.2 summarizes The descriptive statistics of the prefixes of both the available and unavailable conditions.

Table 4.2

Descriptive Statistics of the Prefix Test in Norming Study 1

Condition	*n*	*M*	95% CI	*SD*
+ Prefix	11	1.66	[1.48, 1.83]	0.27
– Prefix	11	0.49	[0.24, 0.74]	0.37
Total	22	1.07	[0.77, 1.37]	0.67

Note. +/– Prefix = Prefix-Available/Unavailable Condition, the maximum possible score was 2.00.

Selection of Target Words. Target words for the material of the main experiment were selected on the following basis: A target word consists of the prefix selected through the norming study and a noun that is below Level 5 of the *JACET 8000 vocabulary list* (Ishikawa et al., 2003) or assumed to be known to the group of participants (i.e., Japanese undergraduate and graduate students). The target words and the prefixes selected through this norming study are summarized in Table 4.3. For the reason of this selection, see Section 3.2.3.1.

Table 4.3

Target Words with Prefixes Selected Through Norming Study 1

Prefix-available condition		Prefix-unavailable condition	
Prefixes	Target words	Prefixes	Target words
anti-	*antihero*	*arch-*	*archenemy*
re-	*redescription*	*ab-*	*abnormality*
non-	*nonmember*	*per-*	*peruse*
un-	*unrest*	*ante-*	*anteroom*
sub-	*subeditor*	*bi-*	*biplane*
mid-	*midship*	*de-*	*depopulation*
mis-	*misdirection*	*circum-*	*circumnavigation*
pre-	*prehistory*	*ob-*	*oblong*
neo-	*neogeography*	*pro-*	*protractor*
dis-	*discomfort*	*ex-*	*exposition*
ad-	*adjudgment*	*com-*	*compassion*

Note that the distinction of the prefix availability made in Norming Study 1 was not necessarily applicable to the participants in the main experiment. Thus, this distinction was to be interpreted as the enhancement of the possibility that the prefixes in Table 4.3 are known/unknown to the participants in the main experiment. This would be solved methodologically in the main experiment.

4.1.2.2 Norming Study 2: Creation and Selection of Experimental Passages

Purpose. Norming Study 2 was conducted (a) to create a sentence for each target word and (b) to ensure that the sentences created were not informative enough to be able to infer the meaning of a target word.

Participants. The participants in Norming Study 2 were 10 Japanese undergraduate and graduate students who had not participated in Norming Study 1. Their majors varied, such as humanities, engineering, and international studies.

Material. Two sentences were created for each target word, and the total number of the sentences was 44. Words in Level 5 or higher in the *JACET 8000 vocabulary list* (Ishikawa et al., 2003) were replaced with high-frequency words other than the target words. All target words were replaced by parentheses (Figure 4.2). This is because the purpose of this norming study was to create sentences whose contextual information would not help participants infer the meaning of the target words.

I heard a news story about a crime which happened this morning. The reporter said (　　) was spreading all over the town.

（　　）に入る語の意味を下の欄に日本語で記入してください。				
意味：				
（　　）に入る語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

Figure 4.2. Example of the material in Norming Study 2. The direction written in Japanese translates as follows: Write down the meaning of the word in the parentheses in the blank space below in Japanese.

Procedure. Participants were asked to infer the meaning of the target word, which was missing from the sentence, and to write the inferred meaning on the sheet in their L1.

Scoring and results. The way of scoring participants' responses was the same as that of Norming Study 1 of the first experimental study. The inter-rater agreement was 84.85%, $\kappa = .659$, $p < .001$, and discrepancies were solved through discussion between the raters. Finally, 22 sentences whose scores were lower than the others were chosen for the material of the main experiment based on the results.

4.1.2.3 Main Experiment

Participants. The participants were a total of 35 Japanese undergraduate and graduate students (22 women and 13 men; average age = 20.49; range = 18−24), who had participated in neither norming studies 1 nor 2. They majored in varied subjects, such as humanities, engineering, art and design, informatics, and biological resource. Some participants reported their qualifications or scores on large-scale English tests (i.e., EIKEN, TOEIC, or TOEFL) on the questionnaire that was distributed before the experiment began. The result was as follows: 23 participants reported their EIKEN grades (Grade 3: $n = 4$, Grade Pre-2: $n = 2$, Grade 2: $n = 16$, Grade 1: $n = 1$), seven reported

scores of the TOEIC L&R (range = 610–925, average score = 741.71), two reported scores of the TOEFL ITP (range = 480–550, average score = 515), and one reported a TOEFL iBT score (73). Five participants reported one or more than one scores, and eight did not report any score. Judging from the self-reported scores, participants' English proficiency was estimated to approximately from pre-intermediate to intermediate level.

Materials.

Lexical-inferencing task. The lexical-inferencing task that I created included a total of 22 questions comprising sentences selected after Norming Study 2, each of which contained a target word (Figure 4.3). All the target words were underlined. Each item has two check boxes to have participants to judge whether they already knew the target word in the sentence prior to undertaking the experiment. The whole part of the lexical-inferencing task are in Appendix B.

I heard a news story about a crime which happened this morning. The reporter said unrest was spreading all over the town.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。	この単語を知っていましたか？
意味：	□はい　□いいえ

Figure 4.3. Example of the lexical-inferencing task in Experiment 1. The direction written in Japanese translates as follows: Write down the meaning of the underlined words in the blank space below in Japanese; Question: Did you already know this word before? Choices: □Yes □No.

Vocabulary-size test. To measure each participant's vocabulary size, the Mochizuki Vocabulary-Size Test in Aizawa and Mochizuki (2010) was adopted for this experiment. This is because this vocabulary-size test was developed for Japanese EFL learners and can measure a test taker's vocabulary size to a maximum of 7,000 words. The first 1,000

word level was omitted based on the assumption that since the participants were university students, they would know the first 1,000 basic English words; thus six sections of the vocabulary-size test (2,000−7,000 word levels) were used in this experiment.

Prefix test. A prefix test, which was the same as the one used in Norming Study 1, was used in the main experiment with the following exception: It included 22 target prefixes matching those of the target words. This test was conducted in the main experiment to confirm that the division of the prefixes into the available and unavailable conditions undertaken in Norming Study 1 was applicable to the main experiment.

Procedure. The experiment was conducted with participants either individually or in groups. Figure 4.4 summarizes the whole procedure of the main experiment. Before the experiment began, I gave both oral and written explanations of the purpose and procedure of the main experiment to participants. Then, I received the participants' informed consent and started the procedure. First, participants were instructed to work on the vocabulary-size test. They were given three minutes to answer questions in each section of the test. The participants choose one English word corresponding to a Japanese definition out of six options for each question. After finishing the vocabulary-size test, the participants were told to engage in the lexical-inferencing task.. The participants were told to make their utmost effort to infer the meaning of the target word (Hamada, 2014) and write the inferred meaning in the blank on the sheet in their L1. The participants were also asked to judge whether they already knew the target word in the sentence prior to undertaking the experiment and to correspondingly check either the "yes" or "no" box. Finally, the prefix test was administered. Both the lexical-inferencing task and the prefix test were conducted under no time limit. Almost all participants went through the whole procedure in approximately 60 minutes.

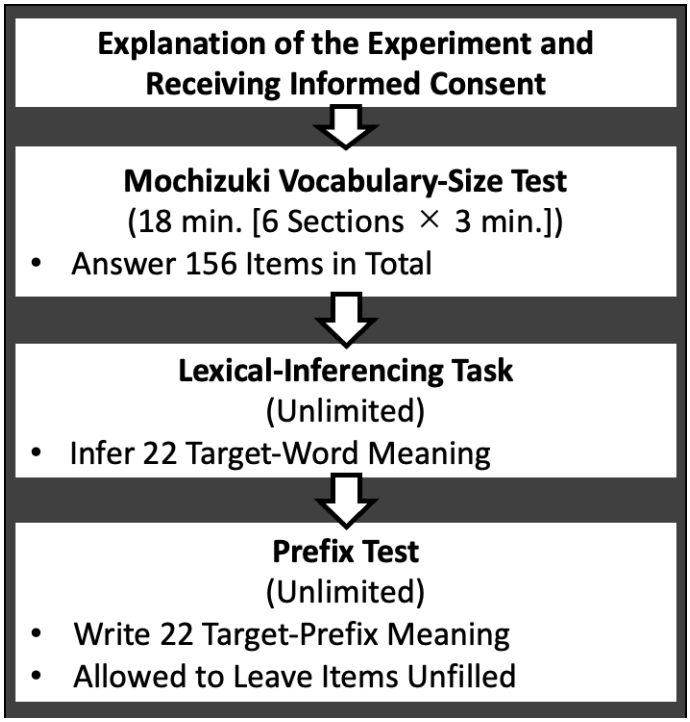


Figure 4.4. Procedure of the main experiment in Experiment 1.

Scoring and Data Analyses.

Vocabulary-size test. The answers of the vocabulary-size test were rated as either 0 (incorrect) or 1 (correct). This binary data were substituted into the following formula provided by Aizawa and Mochizuki (2010) to calculate a participant's estimated vocabulary size: Estimated vocabulary size = number of correct answers ÷ 26 × 1000.

Since the first 1,000 word level was omitted as mentioned above, 1,000 was added to the outcome of the calculation to make the estimated vocabulary size precise. The reliability of the test was sufficient (Cronbach's $\alpha = .93$).

Prefix test. The way of scoring participants' responses was the same as that of Norming Study 1. The inter-rater agreement was 88.64%, $\kappa = .795$, $p < .001$, and discrepancies were solved through discussion between the raters. Because the distinction of the prefix availability (i.e., +/– Prefix condition) made in Norming Study 1 was not necessarily applicable to the participants in the main experiment, the classification of the

prefix availability was newly done based on the responses on the prefix test in the main experiment; the responses that were rated 1 or 2 were categorized under the prefix available condition, and those rated 0 were classified in the prefix unavailable condition (i.e., +prefix/–prefix conditions).

Lexical-inferencing task. The way of scoring the lexical-inferencing task was the same as that of the prefix test in Norming Study 1. Table 4.4 shows an example of the scoring for the lexical-inferencing task.

Table 4.4

Example of Scoring for the Lexical-Inferencing Task in the Main Experiment for unrest

Score	Scale	Example
2	Successful	*fuan* (“unrest”)
1	Partially successful	*arasoi* (“struggle”)
0	Unsuccessful	*teiden* (“power failure”)

The inter-rater agreement was 80.91%, $\kappa = .699$, $p < .001$, and discrepancies were solved through discussion between the raters. Words that participants judged as known words and for which they wrote the correct meanings were excluded from analysis.

To statistically compare the effect of the prefix availability with that of the groups’ difference in participants’ vocabulary size, a 2 (Vocabulary [between]: upper vs. lower) × 2 (Prefix [within]: available vs. unavailable) analysis of variance (ANOVA) was conducted for the scores of the lexical-inferencing task.

4.1.3 Results

4.1.3.1 Vocabulary-Size Test

Table 4.5 summarizes the result of the vocabulary-size test. Participants were divided into two vocabulary size groups based on the median (*Mdn* = 5385): the upper (*n* = 18) and the lower (*n* = 17). A *t*-test result of the scores on the vocabulary-size test showed a significant difference between the two groups, $t(33) = 6.97$, $p < .001$, $d = 2.36$.

Table 4.5

Descriptive Statistics of the Vocabulary-Size Test in Experiment 1

Vocabulary size	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Upper	18	5606.84	[5483.13, 5730.54]	248.75	5385	6346
Lower	17	4683.26	[4425.56, 4940.95]	501.21	3269	5269
Total	35	5158.24	[4949.72, 5366.77]	607.04	3269	6346

4.1.3.2 Lexical-Inferencing Task

Table 4.6 summarizes the descriptive statistics of the scores of the lexical-inferencing task. The results of a two-way ANOVA conducted for the scores on the lexical-inferencing task revealed the following points: The results did not show an interaction between prefix availability and vocabulary-size group, $F(1, 33) = 0.02$, $p = 894$, $\eta^2 = .00$. Regarding prefix availability, however, there was a statistically significant difference between the available and unavailable conditions, $F(1, 33) = 118.68$, $p < .001$, $\eta^2 = .57$. Also, the ANOVA yielded a main effect of vocabulary size, $F(1, 33) = 8.52$, $p = .006$, $\eta^2 = .06$. This indicates that there was a significant difference between the upper and lower groups of participants' vocabulary size.

Table 4.6

Descriptive Statistics of the Lexical-Inferencing Task in Experiment 1

		+ Prefix			– Prefix		
Vocabulary size	*n*	*M*	95% CI	*SD*	*M*	95% CI	*SD*
Upper	18	1.07	[0.95, 1.19]	0.25	0.86	[0.73, 0.98]	0.25
Lower	17	0.97	[0.87, 1.08]	0.20	0.64	[0.50, 0.77]	0.26
Total	35	1.02	[0.95, 1.10]	0.23	0.75	[0.66, 0.85]	0.28

Note. +/– Prefix = Prefix Available/Unavailable Condition; the maximum possible score was 2.00.

4.1.4 Discussion

4.1.4.1 The Effect of a Prefix Clue on Lexical Inferencing (RQ 1-1)

The ANOVA for the scores on the lexical-inferencing task yielded a main effect of prefix availability. Taken together, this result and the mean scores in Table 4.6 indicate that the score on the lexical-inferencing task in the available condition is significantly higher than in the unavailable condition. This result and the fact that the effect was between medium and large ($\eta^2 = .57$) together indicate that the availability of prefixes in target words strongly contributed to the successful inference of word meanings. This suggests that the EFL learners probably used morphological clues in unknown words to successfully infer word meanings. This supports the findings of prior studies (de Bot et al., 1997; Haastrup, 1991). De Bot et al. (1997) proposed that learners might use information such as morphological clues, contextual information, and world knowledge. Drawing on both de Bot et al.'s explanation of L2 lexical inferencing and our results, we can assume that a prefix clue helps EFL learners connect the unknown word with their

conceptual knowledge, leading them to successfully infer word meaning.

In addition, the results suggest that the learners used the clues extracted from the prefix in the target words. Because a previous study (Hamada, 2014) suggested that it was necessary to focus on L2 learners' use of derivational affixes, which were assumed to be more complex than compound nouns, for lexical inferencing, it appears that the finding that they are able to use prefix clues for lexical inferencing might have led us one step further. From this finding, it can be assumed that L2 learners may be sensitive not only to word-level morphemes (free morphemes) but also to affix-level ones (bound morphemes).

4.1.4.2 The Effect of L2 Vocabulary Size on Lexical Inferencing (RQ 1-2)

The result of the ANOVA and the scores in Table 4.6 showed that the scores of the participants in the upper group for vocabulary size were significantly higher than those of the participants in the lower group. However, the effect of vocabulary size cannot be said to be large according to the effect size of the main effect of vocabulary size ($\eta^2 = .06$). In addition, the ANOVA did not yield an interaction between prefix availability and participant vocabulary size. These results suggest that the effect of a prefix clue on L2 lexical inferencing might not be the result of L2 vocabulary knowledge. This can be explained from the perspectives of (a) L2 morphological awareness and (b) world knowledge, as below:

L2 morphological awareness contributes to L2 vocabulary knowledge through lexical inferencing ability (Zhang & Koda, 2012), so the size of vocabulary is assumed to be dependent on morphological awareness. The morphological awareness of all the participants in the present study might be sufficient to make use of the prefix clues in the target words for successful lexical inferencing. In addition, as discussed in the previous section, the participants in the present study strongly benefited from the prefix clues in

lexical inferencing, which suggests that they have the ability to analyze words into morphemes. Taken together, these presumptions allow us to state that the participants in the upper group in the present study benefited from a sufficient level of L2 morphological awareness, resulting in the significantly higher score than that of the lower group.

However, it should be noted that there might be a possible factor that affected the result of the lexical-inferencing task: participants' world knowledge. The participants in the present study might use world knowledge over morphological and contextual clues. When L2 learners infer word meaning, they are supposed to use linguistic knowledge (e.g., morphological clues), information from the context containing an unknown word, and world knowledge (de Bot et al., 1997; Haastrup, 1991). This was proven by Nassaji's (2003) empirical study reporting that nearly half (46.2%) of the knowledge source that ESL learners used to infer the meanings of unknown words was world knowledge. However, the present study unfortunately neither investigated to what extent the participants used their world knowledge nor controlled for the availability of world knowledge that the participants could use. In addition, the lexical-inferencing task used in this study was in paper-and-pencil form. This methodological limitation prevents further discussion on the result of this experiment. Thus, this is a point that needs to be examined in future research.

4.1.5 Summary of Experiment 1

In Experiment 1, (a) the effects of a prefix clue in an unknown word and (b) the relationship between the use of prefixes and L2 vocabulary size on Japanese EFL learners' lexical inferencing in reading were examined. The results of the lexical-inferencing task revealed that the availability of prefixes in unknown words contributed to EFL learners' success in inferring word meanings (RQ 1-1). This suggests that EFL learners can make

use of prefix clues, which are assumed to be more complex than free morphemes, for successful lexical inferencing when these are available to them. Also, the results of the present study did not show the existence of an interaction between prefix availability and L2 vocabulary size, suggesting that the effects of a prefix clue in an unknown word on EFL lexical inferencing was not related to L2 vocabulary size (RQ 1-2). There are two possible reasons for these results. First, all participants were proficient enough to use the prefix clues in unknown words for successful lexical inferencing thanks to their equal level of morphological awareness. Second, the participants in the present study might have made use of world knowledge rather than morphological or contextual clues. Although L2 learners' use of world knowledge has previously been proposed, and indeed observed, the present study could not reveal its validity.

4.2 Experiment 2: Effects of L2 Reading Proficiency, Prefix Availability, and Contextual Information on Japanese EFL Lexical Inferencing

4.2.1 Purpose, Overview, and Research Questions of Experiment 2

The results of Experiment 1 revealed that both the availability of prefixes in unknown words and L2 vocabulary size contribute in Japanese EFL learners' successful lexical inferencing in reading.

However, in spite of the usefulness of these findings, one issue remains to be addressed: investigation into learners' online processing of information. Observing learners' online processing may be necessary to analyze what kind of clues they actually use during lexical inferencing. As one of the possible reasons for the absence of interaction between prefix availability and vocabulary size, it was suggested that the participants might use word knowledge more than morphological or contextual clues in Experiment 1. This is supported by Nassaji (2003), which used the think-aloud method to

reveal that ESL learners use word knowledge the most, whereas the use of morphological knowledge comes at second place in lexical inferencing.

Thus, it would be worthwhile to examine L2 learners' use of clues during lexical inferencing with the same materials used in the present study through the methodological use of measurements applicable to observe online processing, such as think-aloud protocols.

Experiment 2 aimed to investigate lexical inferencing among Japanese EFL learners in terms of (a) the effects of L2 reading proficiency and morphological and contextual clues on the success of lexical inferencing and (b) learners' strategic use of available clues to infer word meaning. To address these aims, the RQs posed were as follows:

RQ 2-1: Do learners' L2 reading proficiency, prefix availability, and context informativeness affect the success of lexical inferencing by Japanese EFL learners?

RQ 2-2: Do reading proficiency, prefix availability, and context informativeness, if any, affect learners' strategic use of clues to infer word meaning?

This study consists of a norming study and one main experiment. The norming study was administered to select target words and create sentences serving as material for the main experiment, which was conducted to meet the aims of the present experimental study. In the main experiment, the relationship between learner factors and success of inference was examined first. Then, an analysis was administered for verbal protocol collected from Japanese EFL learners via a think-aloud method. To analyze learners' use of inferential strategies obtained as verbal report in detail, Hu and Nassaji (2014)'s

classification scheme, described in Chapter 2, was adapted for the present study, aiming to categorize various lexical-inferencing strategies. Finally, strategies contributing to successful lexical inferencing and those that did not contribute to success were compared in terms of frequency of use.

4.2.2 Method

4.2.2.1 Norming Study 3: Creation and Selection of Experimental Passages

Purpose. Prior to the main experimental study, a norming study was conducted. The purpose of the norming study was to create and select experimental sentences that contain contextual information more or less likely to contribute to successful lexical inferencing.

Material. The 22 target words used Experiment 1 were adopted in this study. Three passages were created per target word (66 passages in all) based on the following criteria: (a) Each passage consisted of one or two sentences, (b) the length of each passage was limited to 25 words maximum, and (c) the words in the passages were adjusted to the level of the participants in the main experiment (i.e., Japanese undergraduate and graduate students). Specifically, words above Level 5 in the *JACET list of 8000 basic words* (Ishikawa et al., 2003) were replaced with other, easier words. The average sentence length was 11.4 words (SD = 0.82). All the target words were placed in parentheses to exclude their morphological information and to measure pure contextual informativeness (Figure 4.5).

There is ( ) growing in the east of the country after a terrible earthquake occurred.

( ) に入る語の意味を下の欄に日本語で記入してください。
意味：

Figure 4.5. Example of the material in the norming study in Experiment 2. The direction written in Japanese translates as follows: Write down the meaning of the word in the parentheses in the blank space below in Japanese.

Procedure. To validate the informativeness of the experimental passages, two participants, Japanese graduate students who majored in English language education, inferred the meanings of the words in parentheses, writing them down in Japanese.

Scoring and Results. Participants' responses were rated by graduate students majoring in English language education who were not participants in the norming study, using a three-point scale (0: *false*, 1: *partially correct*, 2: *correct*). To take the example of *unrest*, *atarashii storii* "a new story" was rated 0, *kyoi* "threat" was rated 1, and *tero* "terror" or "terrorism" was rated 2. The inter-rater agreement was 83.33%, $\kappa = .776$, $p < .001$, indicating that the rating was sufficiently reliable. Discrepancies were solved through discussion among the raters. For each target word, the passage that scored the best of the three was selected to serve as the more contextually informative passage in the main experiment, and the one that scored the worst of the three was chosen as the less contextually informative passage. Thus, 22 more informative passages and 22 less informative passages (hereafter, +informative context/–informative context) were selected for the main experiment.

4.2.2.2 Main Experiment

Participants. The participants in the main experiment were 20 undergraduate and graduate students at a national university in Japan (8 women and 12 men; average age =

21.45, range of age = 19–25). Their specialties varied and included natural sciences, engineering, education, international studies, humanities, and medical sciences.

Participants reported their scores on standardized English proficiency tests administered nationwide (e.g., EIKEN, TOEIC L&R, TOEFL). The result was as follows: 15 participants reported their EIKEN grades (Grade 4 = 2, Grade 3 = 1, Grade Pre-2 = 3, Grade 2 = 7, Grade Pre-1 = 2), six reported scores of the TOEIC L&R Test (range = 650–850, average score = 755), one reported a TOEFL ITP score (460), and one reported an IELTS score (6.0). Seventeen participants reported one or more than one scores, but three did not report any score. Judging from the self-reported scores, participants' English proficiency was estimated to intermediate levels.

Materials.

Lexical-inferencing task. Based on the experimental passages selected in the norming study, four versions of a lexical-inferencing task were created. This was to counterbalance presentations of the experimental passages. Each version contained 22 experimental passages; half of the questions were for + informative context, and the rest were for – informative context (Table 4.7; see Appendix C for all the passages).

Table 4.7
Examples of Experimental Passages in the Lexical-Inferencing Task in Experiment 2

Target word	Context	Example
unrest	+ Informative	A new period of unrest began, following the September 11th terrorist attacks in the United States.
	– Informative	There is unrest growing in the east of the country after a terrible earthquake occurred.
subeditor	+ Informative	Anderson is one of my old friends. He used to be a subeditor of this journal, but he has already quit.
	– Informative	Our boss is on vacation, so I have to check all the articles as a subeditor.

Note. +/– Informative = More/Less Informative Context Condition, target words are underlined.

Prefix test. To examine participants' knowledge of the prefixes that were included in the target words, the same paper prefix test as the one used in Experiment 1 was used.

L2 reading-proficiency test. To measure participants' ability to understand contextual information, an L2 reading-proficiency test was created. This test consisted of items extracted from retired versions of the reading section of EIKEN tests (Obunsha, 2013a, 2013b, 2013c). The following were the reasons behind the use of the EIKEN tests. First, the EIKEN test is one of the most widely used standardized English tests in Japan; thus, its test style is familiar to university students in Japan. Second, the EIKEN tests are classified into seven grades in terms of difficulty, ranging from Grade 5 to Grade 1. This feature is useful in creating a test that corresponds to test-takers' English proficiency. For the reading test in this experiment, two passages were selected from Grade Pre-2, two from Grade 2, and two from Grade Pre-1. Each passage contained four (Grades Pre-2, Pre-1) or five (Grade 2) multiple-choice questions, totaling 26 items.

Procedure. The whole procedure is illustrated in Figure 4.6. The experiment was administered individually. Before taking part in the experiment, participants were informed that they would engage in three kinds of tests and that their voices would be recorded. Then I obtained participants' informed consent for the experiment.

Participants began with the lexical-inferencing task. They were asked to report aloud what they were thinking as they inferred the meaning of the target words underlined in each experimental passage (i.e., think aloud). To show participants what thinking aloud is like, I demonstrated it (see Figure 4.7). Specifically, I thought aloud while inferring the meaning of a word in an example sentence from Hamada (2014). To avoid affecting the content of the participants' thinking aloud, my demonstration included a variety of information, such as word part, context, general knowledge, and evaluation. After the demonstration, participants engaged in a practice question (extracted from Hamada,

2014) to familiarize themselves with the inferencing task. Then participants were given one of the four versions of the lexical-inferencing task at random. Experimental passages were presented on the computer screen using presentation software (Microsoft PowerPoint 2016). First, the word "Ready?" appeared on the screen. By pressing the enter key, participants moved to an experimental passage. After inferring the meaning of a target word in the passage, participants pressed the enter key and the word "Ready?" appeared again. Participants repeated this procedure until they had finished the last question. If participants did not think aloud much, I advised them again on how to think aloud and what to include. Participants were also instructed to report whether they already knew the meaning of the target word.

Last, participants were assigned the prefix test. There was no time limit for the inferencing task or the prefix test. Finally, participants took the reading-proficiency test, with a 30-minute time limit. Most participants finished the whole procedure in 90 minutes.

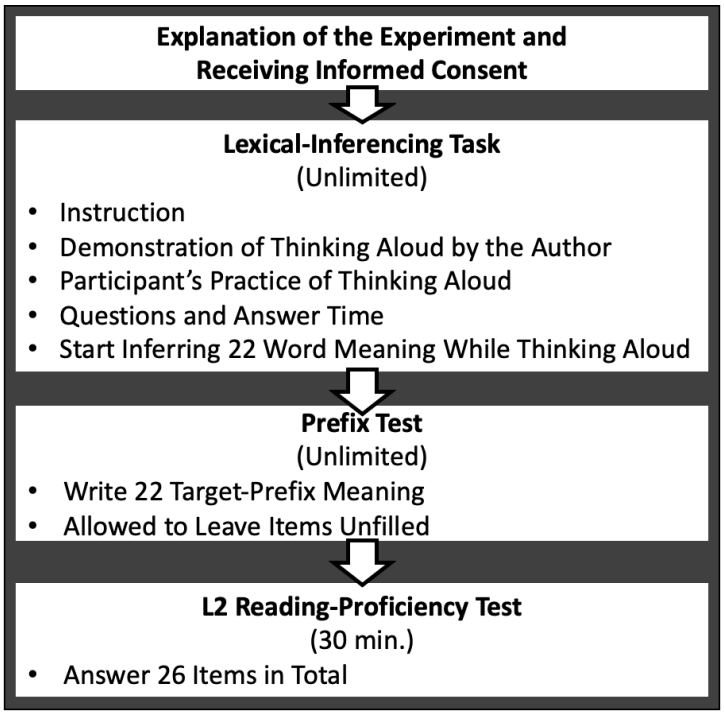


Figure 4.6. Procedure of the main experiment in Experiment 2.

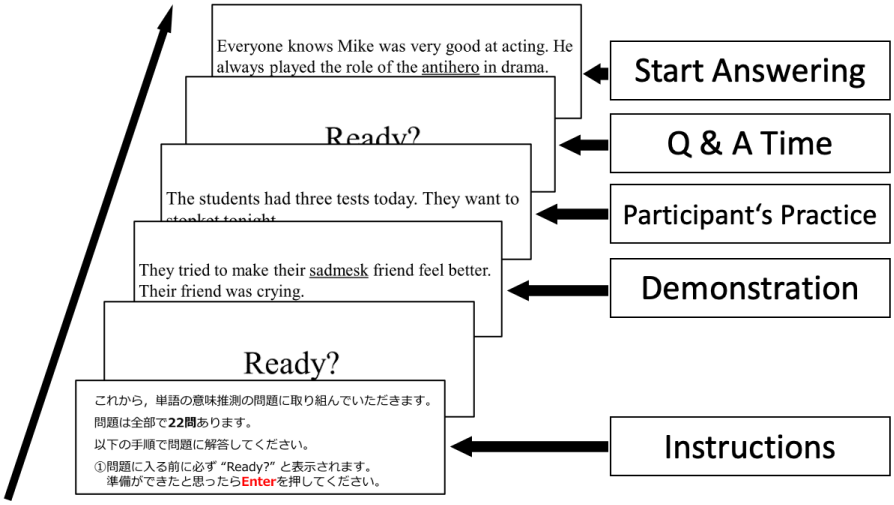


Figure 4.7. Procedure to familiarize participants with the think-aloud method in Experiment 2. Instructions and experimental passages were presented on the PC screen, and participants moved to the next passage by pressing the enter key.

Scoring and Analyses.

Reading-proficiency test. The answers of the reading-proficiency test were rated as either 0 (*incorrect*) or 1 (*correct*). The reliability of the test was sufficient (Cronbach's α = .82).

Prefix test. Based on Experiment 1, responses to the prefix test were rated on a three-point scale (0: *false*, 1: *partially correct*, 2: *correct*). To take the example of *sub-*, *後の* "subsequent" was scored 0, *副次的な* "collateral" 1, and *副* "sub-" 2. I rated all the responses. To ensure intra-rater consistency, I scored 40% of the responses first and then rated the same items again two weeks later. The intra-rater agreement was 93.18%, $\kappa = .937$, $p < .001$, showing that the rating was reliably consistent. Discrepancies were resolved by referring to definitions of the prefixes in dictionaries. Then I scored the remaining 60% of the responses. Finally, responses that were rated 1 or 2 were

categorized under the prefix available condition, and those that were rated 0 were classified in the prefix unavailable condition (hereafter, +prefix/–prefix condition).

Lexical-inferencing task. In reference to the previous study (Ushiro et al., 2013), participants' responses on the lexical-inferencing task were rated using a three-point scale (0: *unsuccessful*, 1: *partially successful*, 2: *successful*). For example, responses to the target word *unrest* were scored as follows: *Danso* "geological fault" was rated as 0, *kimpaku* "tension" as 1, and *fuan* "unrest" as 2. Words that participants reported that they had known prior to the present experiment and to which their responses were correct were removed from the analyses. As to the rating of the lexical-inferencing task scores, the same scoring procedure as that used for the prefix test above was followed to confirm the intra-rater consistency. The intra-rater agreement was 92.05%, $\kappa = .943$, $p < .001$, which was interpreted as sufficiently consistent. Again, discrepancies were resolved by referring to definitions of the target words in dictionaries.

To grasp the way participants attained their answers, what eight participants (four from the high-proficiency group and four from the low-proficiency group) said aloud was transcribed and categorized based on a previous think-aloud study (Hu & Nassaji, 2014; see Table 2.3).

A Mann-Whitney *U* test was conducted for the scores on the lexical-inferencing task to determine differences in proficiency. Similarly, two Wilcoxon signed-rank tests were administered for the scores on the lexical-inferencing task to compare the effect of prefix availability and context informativeness, respectively. Because a total of three statistical analyses were conducted for the same dependent variable (i.e., the scores on the lexical-inferencing task), the significance level was adjusted with the Bonferroni procedure ($\alpha = .05/3 = .016$). Also, 11 Wilcoxon signed-rank tests were conducted for the frequency of each strategy type to examine whether there was any significant difference

in conditions (i.e., L2 reading proficiency and morphological and contextual information). The frequency of strategy use was calculated by dividing the whole number of the appearance of a strategy use by the number of question items.

Strategies that showed significant differences in frequency were then analyzed in terms of success of inference and prefix availability (the subsequent analyses). This was to examine whether the differences in frequency were indeed related to successful lexical inferencing. These strategies were classified into two types in light of successfulness: those that contributed to successful or partially successful inferences (successful-inference [SI] strategies), and the others that resulted in unsuccessful inferences (unsuccessful-inference [UI] strategies). Wilcoxon signed-rank tests were conducted for the frequency of the use of each strategy type to investigate the differences in SI and UI strategies.

Finally, missing values were imputed with mean scores, following Schoonen's (2015) suggestion on coping with missing values in statistical analyses, stating that the "imputation of missing values can be a good alternative" (p. 220).

4.2.3 Results

4.2.2.1 L2 Reading-Proficiency Test

Table 4.8 shows the results of the reading-proficiency test. Participants were divided into a high-proficiency group (n = 10) and a low-proficiency group (n = 10) in reference to the median of the score on this test (Mdn = 14.5). A t-test result showed a significant difference between these two groups, $t(18) = 5.70$, $p < .001$, $d = 2.55$.

Table 4.8

Descriptive Statistics of the Reading-Proficiency Test in Experiment 2

Proficiency	*n*	*M*	95% CI	*SD*	*Min*	*Max*
High	10	18.20	[16.05, 20.35]	3.01	15.00	23.00
Low	10	10.60	[8.49, 12.71]	2.95	4.00	14.00
Total	20	14.40	[12.13, 16.67]	4.86	4.00	23.00

Note. The maximum possible score was 26.

4.2.3.2 Lexical-Inferencing Task (Scores)

Prior to analyzing the scores and transcribed content of the lexical-inferencing task, a chi-square test was used to examine whether there was any bias in the distribution of participants' groups across the four versions of the inferencing task. The result showed no significant differences among the versions, χ^2 (3) = 0.80, p = .849, Cramer's V = .14.

Table 4.9 summarizes the scores on the lexical-inferencing task. The numbers indicate proportions of scores for the items. The results of the Wilcoxon signed-rank test showed a significant difference in prefix availability, z = 3.88, p < .001, r = .61, but the other Wilcoxon test yielded no significant difference in context availability, z = 1.31, p = .189, r = .21. In addition, the Mann-Whitney U test showed no effect of proficiency, U = 30.00, p = .131, r = .34. Taken together, the results of Wilcoxon signed-rank tests and the mean scores described in Table 4.9 showed that the scores in the +prefix condition were significantly higher than those in the –prefix condition.

4.2.3.3 Lexical-Inferencing Task (Verbal Protocols)

The ANOVA for the scores of the lexical-inferencing task showed a significantly better inference in the prefix-available condition than in the prefix-unavailable one.

However, this result depends only on the final outcome of participants' inferences. In other words, it does not show how participants actually made use of available clues, including prefixes. Thus, I analyzed the verbal protocols obtained through the think-aloud method, focusing on the differences in prefix availability.

The results of the classification of strategy use and Wilcoxon signed-rank tests are summarized in Table 4.10. Because the size of the samples ($n = 8$) was small, I interpreted not only significant differences ($p < .05$) but also marginally significant differences ($p < .10$).

Table 4.9

Descriptive Statistics of the Lexical-Inferencing Task in Experiment 2

		+Prefix				–Prefix			
		+Informative		–Informative		+Informative		–Informative	
Proficiency	*n*	*M (SD)*	95% CI	*M (SD)*	95% CI	*M (SD)*	95% CI	*M (SD)*	95% CI
High	10	1.31 (0.31)	[1.09, 1.52]	1.08 (0.26)	[0.89, 1.27]	0.96 (0.73)	[0.73, 1.19]	0.69 (0.32)	[0.46, 0.92]
Low	10	1.16 (0.44)	[0.84, 1.48]	1.04 (0.52)	[0.67, 1.40]	0.55 (0.36)	[0.29, 0.80]	0.77 (0.32)	[0.54, 1.00]
Total	20	1.23 (0.38)	[1.06, 1.41]	1.06 (0.40)	[0.87, 1.25]	0.75 (0.39)	[0.57, 0.94]	0.73 (0.32)	[0.58, 0.88]

Note. +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition, the maximum possible score for each item was 2.00.

Table 4.10

Descriptive Statistics of Strategy Use by Prefix Availability

Strategy	Availability	*M*	95% CI	*SD*	*Z*	*p*	*r*
Analyzing	+Prefix	1.00	[0.59, 1.40]	0.48	1.01	.817	.06
	–Prefix	1.09	[0.65, 1.53]	0.53			
Associating	+Prefix	0.06	[-0.03, 0.15]	0.11	0.31	.753	.08
	–Prefix	0.08	[0.00, 0.17]	0.10			
Repeating	+Prefix	0.26	[0.04, 0.47]	0.26	1.86	.063†	.47
	–Prefix	0.54	[-0.01, 1.08]	0.65			
Using textual clues	+Prefix	0.56	[0.26, 0.86]	0.36	1.30	.195	.32
	–Prefix	0.68	[0.34, 1.02]	0.41			
Using prior knowledge	+Prefix	0.12	[0.03, 0.22]	0.11	1.86	.063†	.47
	–Prefix	0.27	[0.08, 0.47]	0.24			
Paraphrasing	+Prefix	0.02	[-0.01, 0.04]	0.03	2.66	.008**	.67
	–Prefix	0.22	[0.09, 0.35]	0.16			
Making inquiry	+Prefix	0.06	[-0.03, 0.15]	0.11	0.37	.715	.09
	–Prefix	0.07	[-0.01, 0.14]	0.09			
Confirm/disconfirming	+Prefix	0.12	[-0.02, 0.26]	0.17	0.67	.500	.17
	–Prefix	0.13	[0.03, 0.24]	0.13			
Commenting	+Prefix	0.10	[-0.02, 0.22]	0.14	0.68	.498	.17
	–Prefix	0.16	[0.08, 0.23]	0.09			
Stating the failure/	+Prefix	0.16	[0.02, 0.30]	0.16	1.55	.122	.39
difficulty	–Prefix	0.29	[0.06, 0.52]	0.28			
Reattempting	+Prefix	0.03	[-0.03, 0.08]	0.07	0.45	.655	.11
	–Prefix	0.03	[-0.02, 0.08]	0.06			

Note. +/– Prefix = Prefix Available/Unavailable Condition; †$p < .10$, **$p < .01$; the suspending judgment strategy was omitted from this table because no utterance involving it was found.

The results of Wilcoxon signed-rank tests showed a significant difference in the paraphrasing strategy, $z = 2.66$, $p = .008$, $r = .67$, and two marginally significant differences in the repeating, $z = 1.86$, $p = .063$, $r = .47$, and prior-knowledge strategies, $z = 1.86$, $p = .063$, $r = .47$, respectively. Taken together, these results and the mean scores described in Table 4.10 suggest that lack of prefix availability possibly prompted participants to increase their use of these three strategies.

These results suggest that the repeating, prior-knowledge, and paraphrasing strategies were, respectively, used more in the situation where prefix clues were not informative than in the case where prefixes were useful for lexical inferencing. However, this does not indicate that the increased use of such strategies contributed to successful lexical inferencing. To clarify this uncertainty, whether differences between the strategies that contributed to successful inference and the others was investigated in light of frequency of use. Table 4.11 represents the descriptive statistics of strategy use by prefix availability and successfulness.

Table 4.11

Descriptive Statistics of Strategy Use by Prefix Availability and Successfulness

		+ Prefix			– Prefix		
Strategy	Successfulness	*M*	95% CI	*SD*	*M*	95% CI	*SD*
Repeating	Successful	0.24	[0.04, 0.44]	0.24	0.53	[0.10, 0.95]	0.51
	Unsuccessful	0.36	[−0.14, 0.86]	0.60	0.82	[0.01, 1.63]	0.97
Using prior	Successful	0.18	[0.02, 0.33]	0.19	0.39	[0.03, 0.74]	0.43
knowledge	Unsuccessful	0.14	[−0.09, 0.36]	0.27	0.14	[−0.14, 0.38]	0.29
Paraphrasing	Successful	0.03	[−0.02, 0.07]	0.05	0.13	[0.01, 0.24]	0.14
	Unsuccessful	n.a.	n.a.	n.a.	0.08	[−0.02, 0.18]	0.12

Note. +/– Prefix = Prefix Available/Unavailable Condition.

The results of Wilcoxon signed-rank tests showed a significant difference among the successful-inference (SI) repeating strategies in terms of the prefix availability, z = 2.20, p = .003, r = .55. Taken together, this result and the means of the repeating strategies in Table 4.11 indicated that the repeating strategies that contributed to successful lexical inferencing were used more in the prefix available condition than in the prefix unavailable condition. Excerpt 1 below shows that Participant N.T. repeatedly read the target word *circumnavigation* (bolded) aloud (underlined utterance) and tried to use any clues available to him. It was confirmed that this participant did not know the meaning of the prefix *circum-* through the prefix test, thus he engaged with this item in the prefix-unavailable condition.

Excerpt 1: Utterance from Participant N.T.

1 *I'm really looking forward to* ***circumnavigation. circumnavigation*** *I want*
2 *to visit India..., Egypt, Spain, Brazil, and so on.* **circumnavigation**.....、
3 **circumnavigatio** を楽しみにしている...、して navigation 案内、circum
4 circumstance 状況、うーんでそれで...と何がつながるんだ？、インド？エジプト？ス
5 ペイン？ブラジル？...、その **circumnavigation... circumnavigation**.....、
6 XXXX？でも普通に旅行なんだろうか・・...、Egypt Asian —**cumnavigation** 全
7 部大陸は違う...、Brazil か大陸は違う、世界一周 一周な訳ねえなあ、・・うーん
8 .....、**circum**、**navigation**、案内、...うーん？、lookin-...うーーん海外旅行.....、
9 えー...、この単語の意味は海外旅行だと思います以上です

Note. The target word *circumnavigation*, shown in bold, is presented in the more contextually informative condition; the parts of the verbal protocol of the original passage that the participant only read aloud in a crude form are italicized; XXXX indicates that the part could not be transcribed due to noise or too quiet of a voice.

Excerpt 1 demonstrates the use of the repeating (underlined parts in lines 1, 2–3, 5), associating (underlined with a broken line), and analyzing strategies (underlined with a double line). In contrast, there was no significant difference among unsuccessful-inference (UI) repeating strategies, $z = 1.36$, $p = .173$, $r = .34$.

As for the using-prior-knowledge strategies, no significant difference was found in SI, $z = 1.21$, $p = .225$, $r = .30$, nor for UI strategies, $z = 0.18$, $p = .854$, $r = .05$.

Excerpt 2: Utterance from Participant A.K.

1 *We were sitting in chairs* 椅子に座っています、 *in the anti* ***anteroom****? To the*
2 *hall* ホールへの ん？ホールへの **anteroom** に… **anteroom** で椅子に座ってい
3 ます *waiting for the doors to open*、えーっとドアがあ開くのを待っています、ホール
4 ホールへの anteroom、なんだろ待合室かな、あでも待合室ああ控室は waiting
5 room、待合室も waiting room な気がする、anteroom 部屋なんだろうけど…、
6 *We were sitting in chairs in the* ***anteroom*** *to the hall, waiting for the doors*
7 *open doors to open* うーん、ホールの ホールへの 何とかルームだから…、ホールの
8 前にあるって考えたらなんだろ、でもホールの前に待合室とかあったっけ、ホール…の
9 前の通路、でも通路って廊下っていうか、うーーーん？…、*ante?* うーー*ante* がわか
10 んないなあ…部屋かもよくわかんないし 空間かもしれない うーーん でもホールの
11 前にいる ホールの前に待合室とかあったっけー うーーーん ホール *waiting for*
12 *the doors to open* ホールはよく思い出せないけど、うーーーー待合室でいいかな、
13 じゃあ意味は待合室だと思います、以上です

Note. The target word *anteroom*, shown in bold, is presented in the more contextually informative condition; the parts of the verbal protocol of the original passage that the participant only read aloud in a crude form are italicized.

Excerpt 2 above illustrates the actual use of the using-prior-knowledge strategies by Participant A.K. The prefix test showed the fact that this participant was not familiar with the meaning of the prefix *ante*-, assuring us that she inferred the meaning of the target word *anteroom* without its prefix unavailable. This excerpt indicates that Participant A.K. used her prior knowledge some of the time (underlined parts in lines 3–5, 8–9, 11).

The results of the Wilcoxon signed-rank tests also showed that the SI paraphrasing strategies tended to be used more in the prefix-unavailable condition than in the prefix-available condition, $z = 1.83$, $p = .068$, $r = .46$, whereas there was no significant difference among the UI paraphrasing strategies, $z = 1.63$, $p = .103$, $r = .41$.

Excerpt 3: Utterance from Participant Y.K.

1 *One of the members is a **protractor** in everything. He will not stop talking*
2 *until he becomes satisfied.* Member の 1 人は *is a **protractor** in everything*
3 全てにおいて何とかである。彼は will not stop 話すのを止めない until he
4 becomes satisfie…うーん **pro**, **tractor**, トラクター、トラクター？車両、He will
5 not stop talking XXXX 話を長引かせる、ズルズル喋る、is a **protracotoe** トラ
6 クターhh 全てにおいて話す時も長引かせる XXXX んー？話すのを止めない、空
7 気を読まない？全てにおいて空気を読まない、長引かせる？トラクターhh この単
8 語の意味は、うーん長引かせるとか、ズルズル引き延ばす的な意味かなと思います。

Note. The target word *protractor*, shown in bold, is presented in the less contextually informative condition; the parts of the verbal protocol of the original passage that the participant only read aloud in a crude form are italicized; *hh* denotes the participant's minor laughter; XXXX indicates that the part could not be transcribed due to noise or too quiet of a voice.

Excerpt 3 above exemplifies the use of the paraphrasing strategy by Participant Y.K. Again, the result from the prefix test ensured that this participant did know the meaning of the prefix *pro-*, indicating that she worked on this question item in the prefix-unavailable condition. This excerpt illustrates the use of the paraphrasing strategies (underlined parts in lines 5, 6–7).

4.2.4 Discussion

4.2.4.1 The Effects of Learners' L2 Reading Proficiency, Prefix Availability, and Context Informativeness on the Success of Lexical Inferencing (RQ 2-1)

Prefix Availability. The statistical analyses revealed the effect of the morphological clues, specifically prefix information in the target words, on the success of inference. This result and the large effect size (r = .61) together suggest that prefix availability strongly contributed to successful word inferencing, which is consistent with the result from Experiment 1. More specific analyses of the relationship between the use of strategies and prefix availability will be addressed in the next section.

L2 Reading Proficiency. In contrast to prefix availability, there were no significant difference in L2 proficiency on the success of lexical inferencing among the participants in this study. This result is not in accordance with parts of past research (Brusnighan & Folk, 2012; Nakagawa, 2006), which reported the effect of reading proficiency on successful lexical inferencing. However, the result partially supports the findings of Hamada (2013), which argued that L2 learners were able to activate general meanings of target words regardless of their L2 reading proficiency. There are two possible reasons for the result. First, the L2 reading proficiency of the participants in this study may have been high enough to use some of these strategies to determine the meaning of the target

words. Second, the experimental passages, unlike those used in previous studies (e.g., de Bot et al., 1997; Nassaji, 2003), were not long enough to be contextually informative.

Contextual Informativeness. In addition to L2 reading proficiency, the contextual informativeness was found not to affect word inferencing by the participants in this study. This is contradictory to previous studies insisting on the effect of informative contextual clues on successful lexical inferencing (Brusnighan & Folk, 2012; Haastrup, 1991; Hamada, 2013; Nakagawa, 2006). This result can be explained in terms of methodology. In the norming study of Experiment 2 the extent to which information in the experimental passages was useful for inferring the meanings of the target words was examined by two participants. The two participants were graduate students who majored in English language education and were thus presumably more proficient than the participants who joined the main experiment. Consequently, there may be some gaps between the clues and strategies used by the graduate students and those used by the other participants, confounding the result of the experiment.

To sum up, the answer to RQ 2-1 is as follows: the statistical analyses of the results from Experimental Study 2 indicated that prefix availability was the only factor affecting the success of word inferencing out of the three factors that this study took into account.

4.2.4.2 The Effects of Prefix Availability on Learners' Strategic Use of Clues to Infer Word Meaning (RQ 2-2)

Because the only effect of prefix availability on lexical inferencing was shown by the results of the statistical analyses, RQ 2-2 posed previously was reformulated as follows (renamed as RQ 2-2′):

RQ 2-2′: Does prefix availability affect learners' strategic use of clues to infer word

meaning?

The rest of this section will aim to answer this new research question through discussion of the results from the think-aloud data.

The results from the analyses of verbal protocols from participants' thinking aloud suggest that the lack of prefix availability promoted participants to make use of certain strategies, including the repeating, using-prior-knowledge, and paraphrasing strategies. Thus, the following discussion will address the relationship between the use of these three strategies and success of word inferencing.

Repeating Strategy. The result of Wilcoxon signed-rank test indicated that participants tended to repeatedly read aloud the target words and phrases that contained the target words significantly more in the prefix-unavailable condition than in the prefix-available condition. In addition to this result, the subsequent results of the Wilcoxon signed-rank tests yielded a detailed description of the use of the repeating strategies, which can be summarized as follows: (a) SI repeating strategies were used significantly more in the case where prefixes were not helpful for word inferencing than in the prefix-available condition; (b) the frequency of use was not different in the prefix-available condition. This allows us to assume that the increased use of the repeating strategies in the prefix-unavailable condition led participants to succeed in word inferencing.

This contribution of repeating words or phrases to the success of inferencing is explainable based on the model of lexical inferencing (Huckin & Bloch, 1993). In this model, repeating target words and phrases is supposed to reflect participants' efforts to access working memory. It is assumed that linguistic input enters working memory through a unit called a phonological loop, which connects linguistic input with the central executive of the working memory and can restore information only for a few seconds

(Baddeley, 1986). This implies that L2 learners need to repeat the sound of the target words to keep processing them in working memory. The assumption that participants tried to put information in their working memory for processing using the repeating strategy is supported by actual utterances made by the participants in this study. Excerpt 1 illustrates the use of the paraphrasing strategies (lines 2–3). After this repeating, Participant N.T. used his knowledge on the morphemes in the word (*navigation*) and the associate (*circumstance* from *circum*-). Taken together, this and the explanation of working memory above suggest that the participant activated his knowledge by processing information of the target word in working memory inputted through repeating it. Thus, the repeating strategy may be helpful for processing clues in text.

Using-prior-knowledge Strategy. Increased use of prior knowledge, suggested by the result of the Wilcoxon signed-rank test, can also be explained via the findings of past research. Prior knowledge, or general knowledge of the world, is one of the major clues used for lexical inferencing (Haastrup, 1991; Hu & Nassaji, 2014; Nassaji, 2003; Nation, 2008). For example, Nassaji (2003) reported that general knowledge was the most frequently used resource in the process of inferring a word's meaning. Moreover, the think-aloud data revealed how prior knowledge was used by L2 learners. Excerpt 2 shows that Participant A.K. used her prior knowledge to grasp the meaning of the target word (underlined parts in lines 3–5) and to validate her inference that was determined previously (underlined parts in lines 8–9, 11). These uses of prior knowledge are consistent with the model of lexical inferencing suggested by Huckin and Bloch (1993). In their model, prior knowledge is used to test hypotheses on the meaning of unknown words and is assumed to be relatively easier to access than other knowledge. Thus, the observed use of prior knowledge in Excerpt 2 can be said to reflect a process of testing hypotheses.

However, the increase of the prior-knowledge strategies might not have contributed to success in lexical inferencing according to the results of the two subsequent Wilcoxon signed-rank tests. The results showed that the frequency of use of SI and UI prior-knowledge strategies did not statistically significantly differ in light of prefix availability, suggesting that the observed increase of the prior-knowledge strategies might not necessarily have led to participants' successful lexical inferencing. This can be explained by the following reason: L2 learners' prior knowledge can largely depend on their interests, major, and experience. The majors in which the participants in the main experiment engaged varied, such as natural sciences, engineering, education, international studies, humanities, and medical sciences, and their ages were also diverse, ranging from 19 to 25 (average age = 21.45). These facts allow us to state that the prior knowledge possessed by the participants in this study was not necessarily homogeneous. Thus, it is possible that some of the participants used their prior knowledge, although it was not helpful to succeed in correct inferencing.

Paraphrasing Strategy. The result of the Wilcoxon signed-rank test and the large effect size (r = .67) together indicate a strong increase in paraphrasing depending on prefix availability. This allows us to assume that participants possibly paraphrased part of an experimental passage more when they could not make use of prefix clues than when prefixes were available in the target words. The subsequent Wilcoxon signed-rank tests indicated that SI paraphrasing strategies tended to be used more in the prefix-unavailable condition than in the prefix-available condition. The uses of UI paraphrasing strategies were not found to increase in number. These results suggest that the increased use of the paraphrasing strategies might have contributed to successful lexical inferencing. This idea is supported by actual utterances from the think-aloud data. Excerpt 3 shows the use of paraphrasing strategies (underlined parts in lines 5, 6–7). By paraphrasing, Participant

Y.K. reinterpreted the contextual information and the meaning of the target word, leading her to succeed in inferring the general meaning of the target word.

A possible explanation of this increase in paraphrasing is that the experimental passages were easy enough for participants to understand and reconstruct. Indeed, the levels of the words in the experimental passages were adjusted if they were beyond participants' assumed level. This was because the past literature argues that at least 95% of the words in a text should be known to a reader for sufficient comprehension (Laufer & Ravenhorst-Kalovski, 2010). In short, the increased use of paraphrasing strategies might have been due to the strictly controlled materials. This leaves the following possibility to be solved: the results may have differed if more authentic, longer texts, like those used in previous studies (e.g., Hu & Nassaji, 2014; Nassaji, 2003), had been used.

Taken together, the results of the analyses of success in lexical inferencing and the verbal protocols from participants revealed the following points on the use of inferential strategies. The answer to RQ 2-2′ is that prefix availability affected the use of certain strategies. To be more specific, the use of the repeating, prior-knowledge, and paraphrasing strategies increased when prefixes in unknown words were not informative enough to infer word meaning. In addition, the analyses of the verbal protocols from participants demonstrated that the increased use of repeating and paraphrasing strategies might have contributed to successful lexical inferencing.

4.2.5 Summary of Experiment 2

Experiment 2 explored the effects of learners' L2 reading proficiency, prefix availability, and context informativeness on the success of lexical inferencing in Japanese EFL learners. The findings of this study are as follows: First, prefix availability had a strong effect on successful lexical inferences (RQ 2-1). In other words, whether

morphological clues are already known to L2 learners strongly affects their success at inferring a word's meaning. Second, when an L2 learner encountered an unknown prefix in an unknown word, the learner tended to repeat the phrase, trying to determine its meaning using prior knowledge or construct a phrase in which the word's meaning might be easier to infer (RQ 2-2′). These strategies support Huckin and Bloch's (1993) model of lexical inferencing.

4.3 Experiment 3: Relationship Between the Use of Prefix and Contextual Clues and Learner Factors in Japanese EFL Lexical Inferencing

4.3.1 Purpose, Overview, and Research Questions of Experiment 3

Experiments 1 and 2 tried to explore the relationship between the use of clues, both available and unavailable, (Experiment 1 focused on morphology and Experiment 2 on contextual informativeness) and learners' proficiency (Experiment 1 focused on vocabulary size and Experiment 2 on reading proficiency) in lexical inferencing. As stated in Chapter 2, lexical inferencing is a process in which L2 learners make an informed guess about an unknown word's meaning by employing the available clues (e.g., morphology, contextual information; Haastrup, 1991), hypothesizing the word's meaning (e.g., Huckin & Bloch, 1993), and associating it with known concepts in their mental lexicon (e.g., de Bot et al., 1997). Regarding the available clues, learners tend to use the morphemes in the unknown target word, contextual information, discourse as well as their prior knowledge (Nassaji, 2003; Paribakht & Wesche, 1999). Further, use of these clues may be affected by learners' L2 proficiency such as vocabulary size and reading proficiency (Hamada, 2014; Zhang & Koda, 2012). The experiments described so far revealed the usefulness of prefix knowledge and learners' sensitivity to available clues when inferencing a word's meaning.

However, the two experiments could not completely analyze the relationship between the use of available clues and learner factors (i.e., vocabulary size and reading proficiency). There are still several points that need consideration. First, the participants differed in the two experiments, that is, different groups of learners participated in Experiments 1 and 2. Therefore, simply comparing the results of Experiments 1 and 2 is not expected to provide useful information on L2 lexical inferencing. Second, the experimental passages differed in the two experiments. The inferencing task in the first experiment was conducted using only neutral contexts, while the second one involved both more and less informative contextual texts. The third point concerns the difference in methodology: Experiment 1 involved a paper-and-pencil based lexical-inferencing task, whereas Experiment 2 adopted the think-aloud method, with the experimental passages being presented on the PC screen.

In addition to the relationship between the use of available clues and learner factors, there is one another important factor that affects lexical inferencing: instruction and evaluation. As stated in Chapter 2, lexical inferencing is a necessary skill in autonomous L2 reading and learning words from context (Nation, 2013). However, L2 learners often lack in inferencing skills. For instance, Nassaji (2003) found that approximately a quarter of inferences made by ESL learners were correct (25.6%), while about 18% were partially correct. In the present experiments, the lexical inferencing success rates, as judging from the 95% CIs of the inferencing tasks (0.29 and 1.52, respectively), ranged from 13% to 75%. This shows that the success rate varies. These findings suggest that lexical inferencing should be taught explicitly to learners to help them read text autonomously and effectively learn words through reading. In fact, in the setting of English education in Japan, the current course of study for senior high school (MEXT, 2009) prescribes English teachers to give consideration to “listening and reading while guessing the

meaning of unknown words and using background knowledge" (p. 111). No matter how much lexical inferencing is encouraged to be taught, the instruction itself will not be effective unless teachers evaluate their outcome of teaching. For this, EFL educators need to create or make use of measures such as an achievement test, a diagnostic test, or other suitable tests. This issue has attracted me to the potential of the lexical-inferencing task as a diagnostic test in analyzing the difficulties faced by a learner in lexical inferencing. Considering both simplicity and practicality, I focus on the possibility of a paper-based multiple-choice task whose choices are either relevant or irrelevant to the morphological and/or contextual clues.

Thus, Experiment 3 aims to reveal the relationship between the use of clues and learner factors and difficulty faced by L2 learners in lexical inferencing. In addition, this experiment explores the possibility of a simple paper-based task for observing the process participants engage in during lexical inferencing. Specifically, in Experiment 3, I would (a) measure L2 vocabulary size and reading proficiency of the same group of EFL learners, (b) create a multiple-choice lexical-inferencing task, and (c) analyze the patterns of participants' choice selection to observe the lexical-inferencing process they engage in and reveal the relationship between selectivity of each choice and learners' L2 proficiency. In the lexical-inferencing task for this experiment, the target words were presented under four different conditions (two prefix-availability conditions [available vs. unavailable]) × two context conditions [more vs. less informative]). After careful comparison and statistical analyses of the results, the relation between the frequency of selected choices (choice selectivity) and learners' proficiency would be discussed. The following RQs were posed to achieve the purpose of Experiment 3:

RQ 3-1: Is it possible to observe the lexical-inferencing process of EFL learners using a paper-based multiple-choice lexical-inferencing task?

RQ 3-2: Is there a tendency among EFL learners to select certain choices in a multiple-choice lexical-inferencing task?

RQ 3-3: Do EFL learners' vocabulary size and reading proficiency affect their selectivity of choices while engaging in the lexical-inferencing task?

4.3.2 Method

4.3.2.1 Participants

The participants in this experiment were 113 students at a university in Japan (88 women and 25 men; average age = 18.17, age range = 18–23). All the participants were native speakers of Japanese except one who was from Nepal and had learned EFL for at least six years in formal education in Japan. They were students of nursing, English, and psychology and welfare. Data of five students (2 women and 3 men) were excluded from the data set: some of them did not complete part of the experiment procedure, while scores of some were considered outliers judging from the test results. Thus, data of 108 students were used for analyses.

To evaluate participants' general English proficiency, a questionnaire was administered asking them to report their qualifications or scores in standardized English tests conducted nationwide in Japan (e.g., EIKEN, TOEIC L&R, TOEFL). The result was as follows: 74 participants reported their EIKEN grades (Grade 4 = 6, Grade 3 = 19, Grade Pre-2 = 32, and Grade 2 = 17), one reported the score of TOEIC L&R Test (735), and the rest did not report any score. Judging from the self-reported scores, participants' English

proficiency was estimated between beginner and intermediate levels.

4.3.2.2 Materials

Vocabulary-size test. As with Experiment 1, the Mochizuki Vocabulary-Size Test (Aizawa & Mochizuki, 2010) was adopted to measure participants' vocabulary size. In this experiment, seven levels of the vocabulary-size test (1,000−7,000 word levels) were used.

L2 reading-proficiency test. As with Experiment 2, an L2 reading-proficiency test was created to measure participants' ability to understand contextual information. In this experiment, three passages each were selected from Grade 2 and Grade Pre-1 of the retired versions of the reading section of EIKEN tests (Obunsha, 2015a, 2015b, 2017a, 2017b). As EIKEN Grade 2 is "aimed at Japanese high school graduates (Eiken Foundation of Japan, n.d.)," and the participants in this experiment were university students, I considered it valid to use past versions of EIKEN Grades 2 and Pre-1 to measure participants' reading proficiency. Each passage contained five (Grade 2) or four (Grade Pre-1) multiple-choice questions, totaling 27 items, followed by a question asking if the participants had previously read the passage.

Lexical-inferencing task. To observe the process participants engaged in during lexical inferencing, a paper-and-pencil multiple-choice lexical-inferencing task was created based on the one in Experiment 2 (Figure 4.9). Target words and experimental passages were the same as those in Experiments 1 and 2. Each target word was an existing present-day English word composed of one prefix and one free morpheme, and the degree of informativeness of each experimental passage was confirmed through the norming study in Experiment 2.

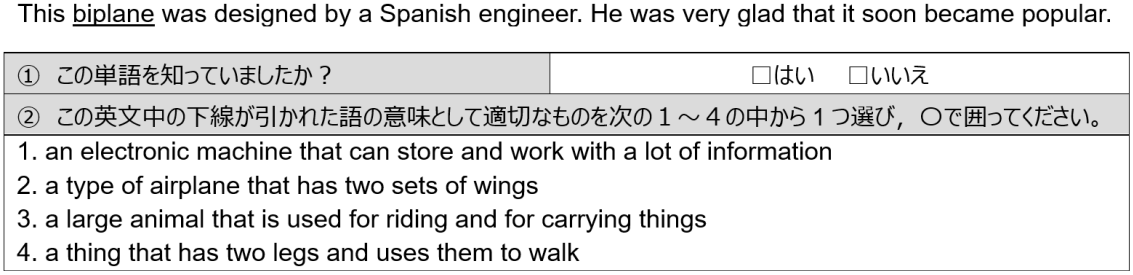
To address RQ 3-1 (examining the possibility of a simple paper-based task for

observing L2 learners' lexical-inferencing process), a new paper-based multiple-choice lexical-inferencing task was created (Figure 4.8), based on the one developed by Hamada (2014). The task had two conditions in terms of the reliability of morphological clues: the morphologically reliable (MR) condition, that is the morphological information in target words is reliable to infer the word's meaning, and the morphologically unreliable (MU) condition, that is there are no informative morphological clues in the target words (see Table 2.2 for examples). Note that the lexical-inferencing task created by Hamada (2014) did not provide a condition where experimental sentences were not unreliable, which hinders investigating the effect of contextual informativeness on successful lexical inferencing. To resolve this blind point, a contextual factor was taken into consideration for designing the present lexical-inferencing task.

Each passage in Experiment 3 contained underlined target words with four choice sentences given in English, and a check box asking "Did you already know this word before?" to confirm whether a participant already knew the target word's meaning. The choice sentences were created by crossing two prefix-availability conditions and two context conditions, thus, totaling four choices. The details of the choices are as follows: (a) one choice contained information that accorded with the meaning of the prefix within the target word, but the whole sentence did not define the target word correctly (Morphology-available choice; hereafter, Mor choice); (b) another choice fit only if judged from the experimental passage, but did not describe the meaning of the target word (Context-available choice; hereafter Con choice); (c) this choice contained information about the meaning of the prefix and was appropriate in terms of context, and hence was the correct answer (Morphology-and-Context available choice; hereafter, MorCon choice); and (d) the fourth choice neither included any clue corresponding to the prefix nor fit the context (No-clue available choice; hereafter, Non choice). Let me explain this

with an example as shown in Figure 4.8: The target word *biplane* can be decomposed into the prefix *bi-*, which means "two" or "multiple," and the noun *plane*. Choice 4 reflects the meaning of the prefix (i.e., "two legs") but does not define the target word (i.e., Mor choice); Choice 1 is contextually correct but does not represent the meaning of *biplane* (i.e., Con choice); Choice 2 includes the morphological clue (e.g., two sets of wings) as well as fits the context (i.e., MorCon choice); and Choice 3 does not have any information relevant to the prefix nor fits the passage's context (i.e., Non choice). Note that the MorCon choice is always the correct answer.

Two versions of the lexical-inferencing task were created to counterbalance the contextual informativeness of all experimental passages (Sets A and B). In the end, two experimental passages differing in contextual informativeness were allotted to each item, thus, totaling 44 passages. The lexical-inferencing task in Experiment 3 is in Appendix D.


This biplane was designed by a Spanish engineer. He was very glad that it soon became popular.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，○で囲ってください。	
1. an electronic machine that can store and work with a lot of information 2. a type of airplane that has two sets of wings 3. a large animal that is used for riding and for carrying things 4. a thing that has two legs and uses them to walk	

Figure 4.8. Example of the lexical-inferencing task used in Experiment 3. The question and the direction written in Japanese translate as follows: Question "Did you already know this word before?" Choices: □"Yes" □"No"; Direction "Choose the answer in English that best describes the meaning of the underlined word in this passage from the four choices below and circle it."

Prefix test. To examine participants' knowledge of the prefixes within the target words, the paper prefix test as the one used in Experiment 1 was administered to

participants (For more details, see Section 4.1.2.3).

4.3.2.3 Procedure

The experiment was conducted during a university class and lasted two weeks (Figure 4.9). Participants were given the vocabulary-size test and the reading-proficiency test on the first day (Day 1), and the lexical inferencing test and the prefix test were administered a week after (Day 2). The whole procedure was conducted by me.

On Day 1, prior to the experiment, I explained the procedure to the participants and obtained their informed consent. Then, participants were provided with the vocabulary-size test and were given 21 minutes to answer seven sections, three minutes for each section. Next, the reading-proficiency test was administered. Participants were told to (a) answer as many questions as possible within 30 minutes and (b) check the box if they had already read the passage before.

A week later, Day 2 began with the lexical-inferencing task. Sets A and B were randomly distributed among the participants. Referring to Hamada (2014)'s directions, participants were asked to infer the meaning of the underlined target word in the experimental passage even if they found it difficult to guess the meaning. Next, they were to judge whether they already knew the underlined target word and correspondingly check either the "yes" or "no" check box. Participants were told that the question "Did you already know this word before?" was added to check if they already knew or had seen the word in its complete form before, not just part of it. This was to prevent participants from misjudging the meaning of "knowing this word" as knowing at least part of the word. In doing so, I tried to avoid excluding extra target items that were unfamiliar to participants. Lastly, participants were instructed to choose the most suitable answer from the four choices given in English. There was no time limit in the lexical-inferencing task.

Lastly, the prefix test was administered. Participants were asked to write down the meanings of prefixes in Japanese. In doing so, the participants' reproductive knowledge of the prefixes was measured, ensuring their recall of the prefix meanings without any support.

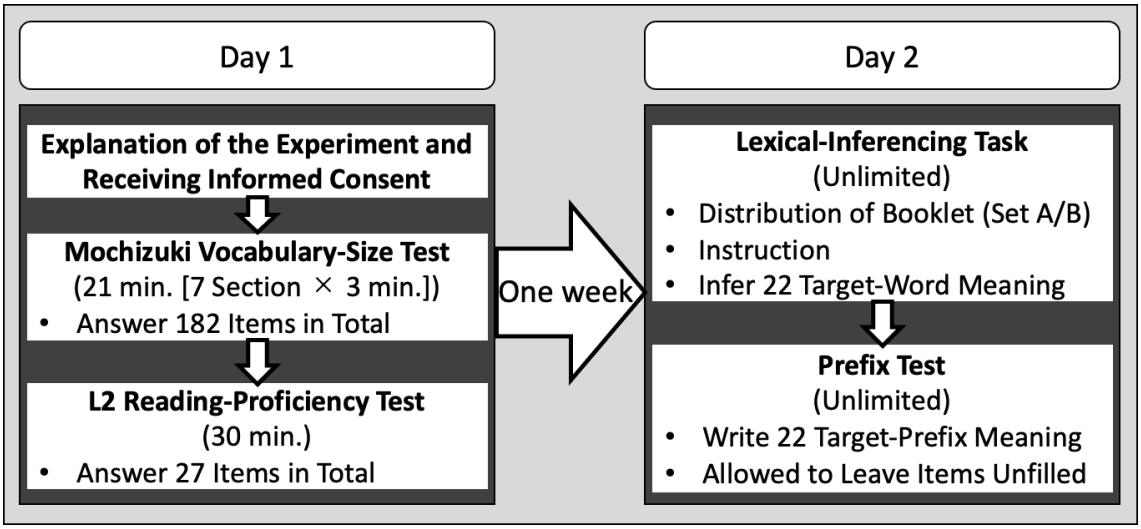


Figure 4.9. Procedure of Experiment 3.

4.3.2.4 Scoring and Analyses

Vocabulary-size test. The vocabulary test was scored similar to Experiment 1, and participants' estimated vocabulary size was calculated. Data from one participant whose estimated vocabulary size was below $M - 3SD$s were removed from the data set to stabilize analyses. The reliability coefficient was sufficient (Cronbach's $\alpha = .94$).

Reading-proficiency test. The reading-proficiency test was scored as in Experiment 2. As the reliability coefficient of the test with all items included was low, six items that yielded negative correlations were removed. Still, sufficient reliability was not obtained (Cronbach's $\alpha = .60$).

Lexical-inferencing task. The rate of each type of choice being chosen (hereafter, selectivity) was calculated per participant. In addition, the selectivity of each choice under the four conditions (i.e., two prefix-availability conditions [available vs. unavailable]) × two context conditions [more vs. less informative]) was computed. Selectivity was calculated by dividing the number of choice types chosen by a participant by the number of items the participant answered (i.e., 22).

Prefix test. Based on the scoring in Experiments 1 and 2, responses to the prefix test were scored based on a two-point scale. As stated in Section 4.1.2.1, some of the target prefixes were polysemous. This time responses were scored as correct only when a response(s) indicated the meaning of the prefix similar to the target word. For instance, the prefix *ex-* means both "out" and "former." One of the target words *excommunication*, which means to put someone out of a religious community or any other group, has *ex-* meaning "out" as its prefix. Therefore, responses that denoted or suggested the meaning "out" were rated as correct. Finally, responses rated as 1 were categorized under the prefix available condition, and those rated as 0 were classified in the prefix unavailable condition (hereafter, +prefix/–prefix conditions).

Statistical analyses. To address RQs, statistical analyses were carried out as follows: I first checked the correlations among the scores of the two English proficiency tests (vocabulary and reading), and selectivity of each choice in the lexical-inferencing task. Then, a multiple regression analysis was performed: choice selectivity in the lexical-inferencing task was considered the outcome variable, and scores in the vocabulary size and reading-proficiency tests were predictor variables.

4.3.3 Results

4.3.3.1 Vocabulary Size and Reading-Proficiency Tests

Table 4.12 summarizes the results of the vocabulary-size and reading-proficiency tests. As for the reading-proficiency test, the maximum possible score was 21 (after the exclusion of six low-reliability items) and the mean was 4.57. This suggests the existence of the floor effect, that is, the reading test used in this experiment was too difficult for the participants. This is also supported by the low reliability of the test (Cronbach's α = .60).

Table 4.12

*Descriptive Statistics of Vocabulary Size and Reading-Proficiency Tests (*N = *108)*

Test	*M*	95% CI	*SD*	*Min*	*Max*
Vocabulary Size	3,428.06	[3,261.81, 3,594.32]	871.57	1,038	5,308
Reading Proficiency	4.57	[4.10 ,5.05]	2.49	0	13

Note. The maximum possible score for the reading-proficiency test was 21.

4.3.3.2 Prefix Availability, Contextual Informativeness, and Choice Selectivity of Lexical-Inferencing Task

The choice selectivity of the lexical-inferencing task under the four conditions (Prefix availability × Context) is summarized in Table 4.13. As is evident, of all the four choices, the MorCon choice was chosen the most under all the conditions. Further, the Non choice was the least chosen choice of the four irrespective of the conditions.

Table 4.13

*Choice Selectivity of Lexical-Inferencing Task under the Four Conditions (*N *=108)*

Choice	+ Prefix		– Prefix	
	+ Informative	– Informative	+ Informative	– Informative
MorCon	.41	.34	.42	.43
Mor	.13	.21	.16	.16
Con	.24	.17	.25	.26
Non	.08	.11	.16	.15

Note. MorCon = Morphology-and-Context Available choice, Mor = Morphology Available choice, Con = Context Available choice, Non = No-Clue Available choice, +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative: More/Less Informative Context Condition.

4.3.3.3 Vocabulary Size, Reading Proficiency, and Choice Rates of Lexical-Inferencing Task

To identify the relationship between the scores of the vocabulary size and reading-proficiency tests, and the choice selectivity of the lexical-inferencing task, correlations between the variables were calculated, which are summarized in Table 4.14

Table 4.14

*Correlations Among the Scores of the Vocabulary Size and Reading-Proficiency Tests, and the Selectivity of the Choice Types of the Lexical-Inferencing Task (*N = *108)*

	M	*SD*	1	2	3	4	5	6
1. VST	3,428.06	871.57	—					
2. RPT	4.57	2.49	.241*	—				
3. MorCon	.43	.13	.476**	.082	—			
4. Mor	.18	.10	–.447**	–.18	–.587**	—		
5. Con	.24	.09	.112	.243*	–.255**	–.348**	—	
6. Non	.15	.09	–.301**	–.15	–.521**	.075	–.248**	—

Note. VST = Vocabulary-Size Test, RPT = Reading-Proficiency Test, MorCon = Morphology-and-Context Available choice, Mor = Morphology-Available choice, Con = Context-Available choice, Non = No-Clue Available Choice, *$p < .05$, **$p < .01$.

The result shows a significant correlation between the performances of the vocabulary-size test and the reading-proficiency test (r = .242, p < .05). The size of L2 vocabulary knowledge has been reported to relate to L2 reading proficiency (e.g., Qian, 2002; Zhang & Koda, 2012). However, the present experiment found a weak correlation between the two proficiency variables (r = .242), which contradicts the findings of previous studies (e.g., Grabe, 2009; Nation, 2013). One possible explanation of this weak correlation is the floor effect, as shown by the low reliability of the test (Cronbach's α = .60). Further, as an overall tendency, L2 vocabulary size significantly correlates with the choice selectivity of the lexical-inferencing task (ps < .01), except the Con choice, whereas L2 reading proficiency has a significant correlation with the selectivity of the Con choice (r = .243, p < .05).

Thus, significant correlations among the performances of the vocabulary-size test and the reading-proficiency test, and the selectivity of each choice in the lexical-inferencing task were found. For detailed understanding of these relationships, multiple regression analysis was performed using the forced-entry method: choice selectivity of the lexical-inferencing task was the outcome variable, and scores of the vocabulary size and reading-proficiency tests were predictor variables. Prior to the analysis, I checked for multicollinearity among the variables, which should be avoided for a precise analysis. One of the criteria of multicollinearity is a strong correlation, r = .90 or higher, among the predictor variables (Takeuchi & Mizumoto, 2014). Judging from the correlation matrix in Table 4.14, the two predictor variables (i.e., vocabulary size and reading proficiency) do not strongly correlate with each other (r = .241). Thus, multiple regression analysis was considered applicable for the present data set without any hindrance.

The result of the regression analysis showed that the two-variable regression model was statistically significant for the selectivity of each choice (p < .05). However, the

regression model did not indicate that both variables were significant for the choices. To obtain more sophisticated results, simple regression analyses for the selectivity of each choice type were performed using the forced-entry method. Specifically, three simple regression analyses were performed for the selectivity of the MorCon, Mor, and Non choices with L2 vocabulary size as the predictor variable, whereas a simple regression analysis was performed for the Con choice selectivity with L2 reading proficiency as the predictor variable. The results of the four multiple regression analyses revealed that there were significant relations between vocabulary size and selectivity of MorCon, Mor, and Non choices respectively, F (1, 106) = 31.13, $p < .001$; F (1, 106) = 26.45, $p < .001$; F (1, 106) = 10.60, $p = .002$; respectively, and reading proficiency and selectivity of Con choice, F (1, 106) = 6.642, $p = .011$ (Tables 4.15–4.18).

Table 4.15

Result of Multiple Regression Analysis for MorCon Choice Selectivity

Variable	*B*	95% CI	*SE B*	β	*t*	*p*
(Intercept)	0.193	[.107, .279]	0.043		4.456***	< .001
VST	0.000	[.000, .000]	.000	0.476	5.580***	< .001

Note. VST = Vocabulary-Size Test, $R^2 = .22$ ($N = 108$, $p < .001$), CI = Confidence Interval for B, ***$p < .001$.

Table 4.16

Result of Multiple Regression Analysis for Mor Choice Selectivity

Variable	*B*	95% CI	*SE B*	β	*t*	*p*
(Intercept)	0.357	[.286, .427]	.036		10.024***	< .001
VST	–0.000	[.000, .000]	0.000	–0.447	–5.143***	< .001

Note. VST = Vocabulary-Size Test, $R^2 = .19$ ($N = 108$, $p < .001$), CI = Confidence Interval for *B*, ***$p < .001$.

Table 4.17

Result of Multiple Regression Analysis for Con Choice Selectivity

Variable	*B*	95% CI	*SE B*	β	*t*	*p*
(Intercept)	0.247	[.107, .279]	0.032		4.456***	< .001
VST	–0.000	[.000, .000]	0.000	–0.301	–3.255**	.002

Note. VST = Vocabulary-Size Test, $R^2 = .08$ ($N = 108$, $p = .002$), CI = Confidence Interval for *B*, **$p < .01$, ***$p < .001$.

Table 4.18

Result of Multiple Regression Analysis for Non Choice Selectivity

Variable	*B*	95% CI	*SE B*	β	*t*	*p*
(Intercept)	0.202	[.166, .238]	0.018		4.456***	< .001
RPT	0.009	[.002, .016]	0.003	0.476	5.580*	.011

Note. RPT = Reading-Proficiency Test, $R^2 = .05$ ($N = 108$, $p = .011$), CI = Confidence Interval for *B*, *$p < .05$, ***$p < .001$.

4.3.4 Discussion

4.3.4.1 Tendency of EFL Learners to Select Certain Choices During Lexical Inferencing (RQ 3-2)

Table 4.13 reveals a certain tendency: (a) the MorCon choice was chosen the most of the four choices under all the conditions, and (b) the Non choice was the least chosen choice of the four irrespective of the conditions. This result conforms with previous studies which argued that L2 learners combine available clues during lexical inferencing (de Bot et al., 1997; Huckin & Bloch, 1993). This implies that participants are sensitive to the available clues and possibly make informed guesses by combining them, and do not randomly guess the meaning of a word. This possibility is supported by the fact that the clues available to the participants in this experiment were in the form of morphological and contextual information in the experimental passages, and the participants chose the Non choice option the least. If the participants were not aware of the available clues in the passages, they would have chosen randomly (i.e., make random guesses), and the selectivity of the choices would not have shown any particular tendency. However, in fact, a certain tendency exists as demonstrated above.

To sum up, the choice selectivity data show the tendency of EFL learners to select choices that reflect available clues (RQ 3-2).

4.3.4.2 Effects of EFL Learners' Vocabulary Size and Reading Proficiency on the Choice Selection of Lexical-Inferencing Task (RQs 3-1 and 3-3)

As presented in Tables 4.15–4.18, all the four simple regression analyses yielded statistical significance models of either of the two predictor variables. However, the results also revealed that the coefficients of determination (R^2) for both Con and Non choices slightly fitted the data (Con: R^2 = .05; Non: R^2 = .08). For this reason, the

following discussion would focus on the data from the MorCon and Mor choice analyses.

As to the selectivity of the MorCon choice, R^2 for the simple regression model of vocabulary size was 22% (Table 4.15), that is, the score of the vocabulary-size test significantly predicts 22% of the selectivity of the MorCon choice in the lexical-inferencing task. In other words, the broader the participants' vocabulary, the more likely they are to choose the MorCon choice when engaging in lexical inferencing. Although the value of coefficient is not high, considering that the MorCon choice is always the correct answer for every item, it suggests that vocabulary size is at least an important factor for successful lexical inferencing using morphological and contextual clues.

As to the selectivity of the Mor choice, R^2 for the simple regression model of vocabulary size was 19% (Table 4.16), that is, the score of the vocabulary-size test accounts for 19% of the selectivity of the Mor choice in the lexical-inferencing task. Note that, unlike the case of MorCon choice, the regression coefficient (β) was negative for Mor choice. Thus, participants with a large vocabulary size tend not to choose the Mor choice.

The results of regression analyses revealed that the performance of the vocabulary-size test predicts the choice selectivity of the lexical-inferencing task to a certain degree (RQ 3-3). The results partially support the findings of Zhang and Koda (2012), which investigated Chinese EFL lexical inferencing using SEM and identified the contribution of morphological awareness to L2 vocabulary knowledge and reading proficiency through the learners' ability to infer a word's meaning. This experiment too revealed the relationship between the use of morphological clues and learner proficiency. However, the direction of contribution was reversed: L2 vocabulary size predicts mixed use of morphological and contextual information. The findings from Zhang and Koda (2012) and Experiment 3 together suggest the existence of bilateral relations between the use of

morphological and contextual clues and learner proficiency in EFL lexical inferencing.

The results of simple multiple regression analyses and the data of choice selectivity of the lexical-inferencing task (see Table 4.13) reveal more about the effects of learners' proficiency on clue use. As for the MorCon choice, the selectivity is lower in the + prefix and – informative conditions than in other conditions. That is, the participants tend not to select the choice that reflects the prefix in the target word and fits contextually when the context is not informative for inferencing even though the morphology (prefix) is known to the participants. In contrast, regarding the Mor choice, the selectivity is high in the + prefix and – informative condition. These facts suggest that even when morphological information is available to the participants, they would not choose the correct option (i.e., the MorCon choice) unless the context is informative enough to infer the word's meaning. As discussed above, participants with large vocabulary size tend to choose the MorCon choice. In other words, they do not choose the Mor choice. Thus, learners with a large vocabulary possibly choose the answers using not only the prefix clues but also the contextual information. This interpretation is in accordance with Hamada (2014), which reported that ESL learners' use of morphological and contextual information during lexical inferencing differed with respect to their English proficiency: learners with low English proficiency failed in inferencing when the word form had nothing to do with the correct meaning, suggesting that the learners were stuck on morphology of the target word. In contrast, high-proficiency learners flexibly changed the clues they relied on to contextual information, resulting in successful inferencing. The findings from Hamada (2014) and the present experiment emphasize the importance of learner proficiency in the flexible use of contextual clues. Note that Hamada (2014) measured participants' general English proficiency with ACT Compass; thus, leaving room for investigating which element of L2 English proficiency in particular affects lexical inferencing. Experiment 3

shows that L2 vocabulary size is one of the key elements for successful inferencing. Thus, EFL learners with low L2 proficiency tend to largely depend on morphological clues because the use of contextual information requires a certain degree of L2 proficiency, and L2 vocabulary size is indicative of their ability to flexibly alter the clues. Combining the available clues is considered the first step in lexical inferencing (e.g., de Bot et al.); therefore, L2 proficiency, especially vocabulary size, seems to play an important role in the initial stages of inferencing.

Lastly, as discussed above, the data from this experiment align with those of the previous studies investigating the process of L2 lexical inferencing. Thus, it is safe to say that the lexical-inferencing process in which EFL learners engage in can be observed using a paper-and-pencil multiple-choice lexical-inferencing task (RQ 3-1).

4.3.5 Summary of Experiment 3

Experiment 3 explored the relationship between the use of morphological and contextual clues and learner factors, and the difficulty EFL learners face in lexical inferencing. The findings of this experiment can be summarized as follows: (a) EFL learners infer a word's meaning by combining clues such as information from the prefix within the target word and context of the sentence, and this process can be observed through a paper-based multiple-choice lexical-inferencing task, (b) performance of L2 vocabulary-size test predicts the selectivity of choices in the inferencing task to some extent, and (c) EFL learners with low L2 proficiency tend to depend on morphological clues because the use of contextual information requires a certain degree of L2 proficiency.

Note that the multiple-choice lexical-inferencing task created in this experiment was ipsative; that is, the selection of one choice influenced the selection of other choices. This was because the purpose of this experiment was to observe participants' use of clues

in a simple, practical way so that EFL teachers could identify the difficulty students face in lexical inferencing during class. Although it was shown that the lexical-inferencing process EFL learners engage in could be observed using a multiple-choice lexical-inferencing task, the results of this experiment should be compared with those of the free-writing version of the inferencing task (e.g., Experiment 1) or the think-aloud study (e.g., Experiment 2).

4.4 Conclusion of Study 1

Study 1 explored the effects of clues available within the text (i.e., morphological and contextual clues) and learner factors (i.e., L2 vocabulary size and reading proficiency) on EFL learners' lexical inferencing. To this end, three experiments were conducted.

Experiment 1 examined the effects of (a) the prefix clue in an unknown word and (b) the relationship between the use of prefixes and L2 vocabulary size on EFL learners' lexical inferencing in reading. The results showed that prefix availability contributed to lexical inferencing. In addition, it was found that learners' vocabulary size affects the success of lexical inferencing. These results suggest two points: EFL learners can make use of prefix clues, which are assumed to be more complex than free morphemes, for successful lexical inferencing when these clues are available to them, and EFL learners with a large vocabulary can benefit from a sufficient level of L2 morphological awareness.

Experiment 2 aimed to investigate Japanese EFL learners' lexical inferencing in terms of (a) the effects of morphological and contextual clues on the success of lexical inferencing and (b) learners' strategic use of available clues to infer a word's meaning. The results of the statistical analyses indicated significant differences depending on prefix availability in the lexical-inferencing task. Further, analyses of verbal protocols revealed that a lack of prefix availability in an unknown word prompted L2 learners to use different

strategies such as repeating, using prior knowledge, and paraphrasing to infer its meaning. These findings indicate that L2 learners with university-level L2 proficiency can change their strategies for inferring a word's meaning according to the availability of morphological clues in an unknown word.

Experiment 3 explored the relationship between the use of morphological and contextual clues and learner factors, and the difficulty EFL learners face in lexical inferencing. The findings of this experiment can be summarized as follows: (a) EFL learners infer a word's meaning by combining clues such as information from the prefix within the target word and context of the sentence, and this process can be observed with a paper-based multiple-choice lexical-inferencing task, (b) performance of L2 vocabulary-size test predicts the selectivity of choices in the inferencing task to some extent, and (c) EFL learners with low L2 proficiency tend to depend on morphological clues because the use of contextual information requires a certain degree of L2 proficiency.

The findings of the three experimental studies suggest the following: First, EFL learners succeed in inferring a word's meaning by making use of morphemes, especially a prefix, in an unknown word when the morpheme is available or already known to the learners; second, EFL learners' sensitivity to the availability of morphological clues results in an increased use of certain strategies in the prefix-unavailable condition; and third, a contextual clue in itself is not effective in lexical inferencing unless it aligns with other available clues such as discourse information or the learners' proficiency is sufficiently high. The insights derived from the findings of this study take the discoveries of past studies on EFL learners' lexical inferencing one step ahead. The next step is to address the question: How L2 vocabulary learning through lexical inferencing is affected by the clues available in the text, in particular, the morphology and informativeness of context? The next chapter would address this query.

Chapter 5

Study 2: Effects of Prefix and Contextual Clues and Learner Proficiency on Vocabulary Learning Through Lexical Inferencing

The three experiments in Study 1 explored the roles of morphological and contextual information and learner factors in L2 lexical inferencing. To sum up, the results demonstrated that L2 learners are sensitive to prefix clues in unknown words and can use morphological clues combined with contextual information. However, using prefix and contextual clues together is difficult, especially for learners with low L2 proficiency. The first three experiments revealed factors governing successful inferencing. The next aim is the outcome of lexical inferencing, namely retention of the inferred word meaning.

Study 2 aimed to examine the retention of inferred L2 word meaning with morphological and contextual information, focusing on learners' vocabulary size and reading proficiency. This study was composed of two experiments. In the first experiment, 79 Japanese EFL university students inferred the meanings of 22 words that contained both known and unknown prefixes (prefix availability) and were in sentences with varying levels of informative context (contextual informativeness). After one week, participants were asked to recall the inferred meanings (Experiment 4). Experiment 5 was administered to 104 EFL undergraduates in the same way as the first experiment, but differed in terms of two aspects, namely a recall task and procedure. These two differences were made (a) to measure participants' recall of inferred word meaning more precisely and (b) explore an instructive way of making retention more efficient. The rest of this chapter explains the purposes, methods, and results of these two experimental studies.

5.1 Experiment 4: Examining Retention of Inferred L2 Word Meaning Based on Morphological and Contextual Clues and Learner Proficiency: Recall Based on Word Form

5.1.1 Purpose of and Research Questions for Experiment 4

Previous research on incidental vocabulary learning has tried to reveal the relationship between L2 learners' use of morphological and contextual clues and their retention of inferred word meaning. For example, Webb (2008) showed that contextual informativeness positively affected retention of word meaning. Scores for meaning recognition and recall tasks were significantly higher under an informative context condition than in less informative conditions. However, his experiment also indicates that learning efficiency is not necessarily high. Less than 15% of the inferred target words were retained by the time the recall tests were conducted. Furthermore, Zhang and Koda (2012) suggested the effect of using morphological information on incidental vocabulary learning, revealing an indirect contribution of the use of morphological clues to vocabulary knowledge and reading comprehension through lexical inferencing ability. However, retention of inferred word meaning based on morphological and contextual clues has not been examined in detail.

Regarding the relationship between the combined use of morphological and contextual clues and vocabulary learning though lexical inferencing, the following contradictory predictions have been posed. First, if L2 learners are given the two types of clues available to them (morphological and contextual), it will be easier to infer word meaning than without any informative clues, leading to the facilitation of incidental vocabulary learning. The second prediction is that when both morphological and contextual clues are available to L2 learners, it will be easier for them to infer word meaning, but they may pay less attention to unknown words, resulting in more difficult

retention of inferred word meaning. This prediction is formed based on arguments provided by research on L2 vocabulary learning and lexical inferencing (e.g., Haastrup, 1991; Laufer, 2003). For example, Haastrup (1991) suggested that easily inferred word meaning is not easily retained. In addition, Laufer (2003) argued that learning that requires a great deal of effort reinforces memory, whereas learning that demands little effort does not. Though both these predictions could add important knowledge to the field, little research thus far has focused on the relationship between morphological and contextual clues and vocabulary learning through lexical inferencing.

In addition, my previous experiments showed the contribution of learner proficiency, especially vocabulary size, to EFL learners' performance on lexical inferencing using prefix and contextual information. This suggests that learners' efforts to infer L2 word meaning are presumably affected by their L2 proficiency and consequently, L2 proficiency affects retention subsequent to inferencing. Thus, it is worth investigating how EFL learners' English proficiency affects vocabulary learning through lexical inferencing using prefix and contextual clues. To ensure the comparability of results, I continued using vocabulary size and reading proficiency in the experimental design as variables of learner proficiency..

To sum up, the purpose of Experiment 4 was to explore how L2 vocabulary learning through lexical inferencing could be affected by clues available in the text, particularly morphology and contextual informativeness, and learners' vocabulary size and reading proficiency. To address this purpose, I formulated three RQs:

RQ 4-1: Do morphological and contextual clues affect the inference of word meaning by EFL university students?

RQ 4-2: Do morphological and contextual clues affect the retention of inferred word meaning by EFL university students?

RQ 4-3: Do L2 vocabulary size and reading proficiency of EFL university students affect inference and retention of word meaning with morphological and contextual clues?

5.1.2 Method

5.1.2.1 Participants

The participants in this experiment were 79 undergraduates at a university in Japan (62 women and 17 men; average age = 18.14 years, range = 18–23 years). They were students in nursing and psychology and welfare. Data from 16 students (12 women and 4 men) were excluded because they did not complete part of the experiment procedure. Therefore, the data of 63 participants were ultimately analyzed.

To determine the participants' general English proficiency, I administered a questionnaire and asked them to report their scores on the EIKEN tests prior to the experiment. Four participants held Grade 4, 18 held Grade 3, 14 held Grade Pre-2, and three held Grade 2, and the other participants did not report any score. Based on responses to the questionnaire, participants' approximate general English proficiency was estimated to be between novice and intermediate levels.

5.1.2.2 Materials

Vocabulary-size test. As in Experiments 1 and 3, the Mochizuki Vocabulary-Size Test was adopted to measure participants' vocabulary size. I used seven sections of the test that range from 1,000–7,000 word levels.

Reading-proficiency test. To measure participants' ability to understand contextual information, the L2 reading-proficiency test created in Experiment 2 was used. As explained for Experiment 2, two passages were selected from Grade Pre-2, two from Grade 2, and two from Grade Pre-1. Each passage contains four (Grade Pre-2, Pre-1) or five (Grade 2) multiple-choice questions for a total of 26 items.

Lexical-inferencing task. Based on the lexical-inferencing task I developed in Experiment 2 of Study 1, a new paper-and-pencil lexical-inferencing task was created (Figure 5.1). The inferencing task used in the second experiment was administered using a computer for methodological reasons (i.e., a think-aloud method). However, the current experiment focused on the retention of inferred word meaning rather than identification of the clues used. Moreover, unlike Experiment 2, this experiment was to be administered to dozens of participants at once during part of a class period, which made it unrealistic to perform the task using computers in the same way as in Experiment 2. Therefore, I created two paper versions of this task with presentations of the experimental passages counterbalanced. This task contained 22 target words used in Experiment 1. Both versions consisted of 22 experimental passages for 22 target words; half of the passages were more informative to infer word meaning (hereafter, + informative context) and the rest were less informative (hereafter, – informative context). Again, informativeness refers to the degree to which the context of the experimental passage contributes to inferring the target word's meaning (see Table 4.8 for example passages). Each item had an answer field with two check boxes to ask if participants knew the target word in the sentence prior to undertaking the experiment. The target words and their context sentences were selected or created through in the norming studies of the norming studies in Experiments 1 and 2.

A new period of unrest began, following the September 11th terrorist attacks in the United States.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。	この単語を知っていましたか？
意味：	□はい　□いいえ

Figure 5.1. Example of the lexical-inferencing task in Experiment 4. The direction and question written in Japanese translate as follows: Direction: "Write down the meaning of the underlined words in the blank space below in Japanese." Question: "Did you already know this word before?" Choices: □ "Yes" □ "No."

Learning-confirmation test. I created a learning-confirmation test in order to measure how many words participants retain the meanings of the target words (Figure 5.2). For each item, a target word was presented and followed by an answer field. The answer field had two check boxes next to it in order to confirm whether participants had ever looked up the target word in their dictionary.

unrest

この単語の意味を下の欄に記入してください。	以前，この単語の意味を調べましたか？
意味：	□はい　□いいえ

Figure 5.2. Example of the learning-confirmation test in Experiment 4. The direction and question written in Japanese translate as follows: Direction: "Write the meaning of this word in the blank space below in Japanese." Question: "Did you look up the word before (this test)?" Choices: □ "Yes" □ "No."

Prefix test. To investigate whether participants knew the prefixes in the target words, participants took a prefix test that I created for Experiment 1 of this dissertation (see Figure 4.1). Note that the meanings and ways of using English prefixes were not explicitly taught before this experiment was conducted, although some of the participants may have been taught those in their secondary education separately.

5.1.2.3 Procedure

The procedure of Experiment 4 is visualized in Figure 5.3. Prior to the experiment, the vocabulary-size test and reading-proficiency test were conducted as part of the achievement tests. These tests were administered in the same way as in Experiment 3. The lexical-inferencing task, the learning-confirmation test, and the prefix test were administered during part of a class period. In the experiment, half of the participants received one version of the lexical-inferencing task and the rest received the other one. Participants were asked to infer the meaning of the target word as hard as possible and write the inferred meaning into the answer field in Japanese in 30 minutes. This instruction was given (a) to prevent the participants from randomly guessing, which would bother interpretation of the result, and (b) to exclude the possibility that the participants would hesitate to answer in L2 because of L2 learner anxiety. They were also told to check the appropriate box to show if they had known the target word's meaning prior to participating in the experiment. Participants were not told that the learning-confirmation test would be assigned one week later.

One week after the lexical-inferencing task, participants were given the learning-confirmation test. They were instructed to write the meaning of each target word into the answer field in Japanese and to check either box off to report if they had looked up the word in their dictionary. They were allowed to leave the item unanswered if they could not recall the word's meaning. Finally, the prefix test was administered to participants. They were instructed to write the meaning of the underlined target prefix in Japanese.

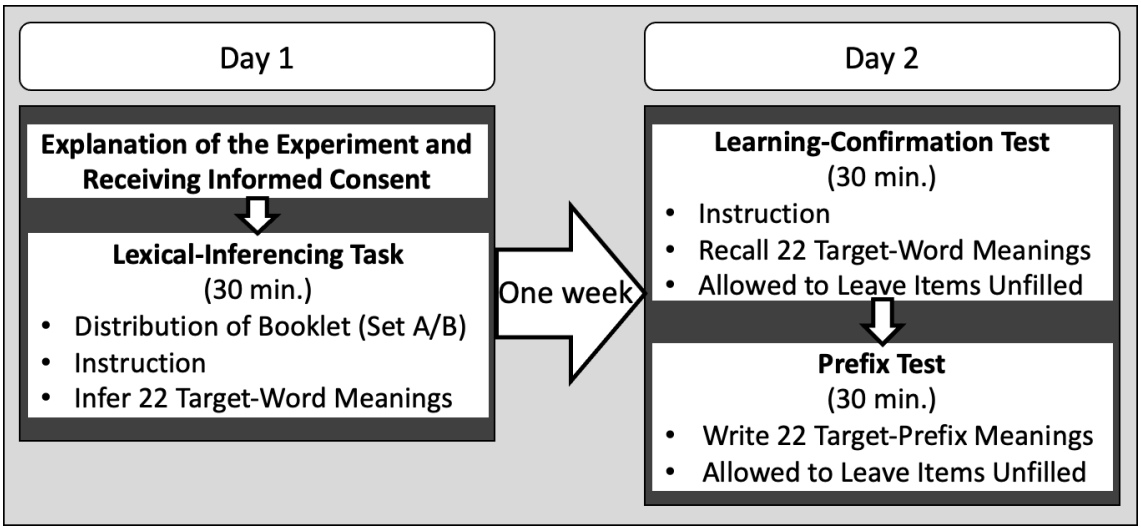


Figure 5.3. Procedure of Experiment 4. The vocabulary-size test and reading-proficiency test were administered prior to the experiment.

5.1.2.4 Scoring and Analyses

Vocabulary-size test and reading-proficiency test. The two proficiency tests were scored in the same way as in the preceding experiments. The reliability of the vocabulary-size test was sufficient (Cronbach's α = .97), but that of the reading-proficiency test was not (Cronbach's α = .39).

Lexical-inferencing task. Based on the previous studies (Nassaji, 2003, Ushiro et al., 2013), participants' responses to the lexical-inferencing task were scored on a three-point scale (0: *unsuccessful*, 1: *partially successful*, 2: *successful*). For example, participants' responses to the target word unrest were scored as follows: *hannin* (criminal) was rated as zero, *yasumanai* (do not take a rest) as one, and *fuan* (unrest) as two. The scoring began with rating 30% of all responses to the task. Raters included a graduate student who had experience teaching English at junior and senior high schools in Japan for more than 22 years, and me, who had experience teaching English at a Junior high school and universities for approximately three years in total. The inter-rater agreement

was 97%, and discrepancies were resolved through discussion by the raters. Then, I scored the rest of the data (70%). Words that participants reported as known words and for which they wrote the correct meanings were excluded from analysis.

Learning-confirmation test. The scoring of participants' responses to the learning-confirmation test followed the scoring process as the lexical-inferencing task depicted above, and the raters were also the same. The inter-rater agreement was 98%, and discrepancies were resolved through discussion by the raters. Words that participants reported as known words and for which they wrote the correct meanings were excluded from analysis. Moreover, the responses to the target words of which participants failed to infer the meanings in the lexical-inferencing task were removed from the analysis.

Prefix task. The scoring and the raters for the prefix task were the same as the ones for the lexical-inferencing task above except the following respect: Participants' responses were rated based on two-point scale. For example, participants' responses to the target prefix ex- were scored as follows: *Moto-no* (original) was rated as zero and *soto-ni* (out) as one. The inter-rater agreement was 99%, and discrepancies were resolved through discussion by the raters. Finally, participants whose responses were rated as one were categorized as the prefix available condition, and those whose responses were rated as zero were classified in the prefix unavailable condition (hereafter, + prefix/– prefix conditions).

Statistical analyses. To statistically investigate the relationship between clue types, word inferencing, retention of inferred word meaning, and learner proficiency, I first conducted two four-way ANOVAs of the scores for the lexical-inferencing task and learning-confirmation test. However, the results of Levene's test for the homogeneity of variances conducted prior to the analyses revealed that the two vocabulary size groups were not homogeneous in terms of their scores for the learning-confirmation test under

the + prefix and – informative (p = .018) and – prefix and + informative conditions (p = .021). Similarly, another Levene's test showed that the two reading proficiency groups were not homogeneous in terms of their scores on the lexical-inferencing task under the – prefix and – informative (p = .044) and – prefix and – informative conditions (p = .039). In this case, ANOVAs should be performed without the two learner factors (i.e., vocabulary size and reading proficiency). Therefore, I conducted a 2 (prefix availability: + prefix vs. – prefix [within]) × 2 (contextual informativeness: + informative vs. – informative [within]) × 2 (task: lexical-inferencing task vs. learning-confirmation test [within]) ANOVA of the scores for the lexical-inferencing task and learning-confirmation test.

Instead of examining the effect of vocabulary size by conducting an ANOVA, I interpreted the results of the two tasks by closely examining means and 95% confidence intervals (CIs) in terms of vocabulary-size difference referring to Plonsky's (2015) suggestions. Plonsky proposes that when the mean of a group is not within the 95% CI of the other group and vice versa, it can be said that the means of these two groups are significantly different (α = .05). Based on this way of comparing means, I examined if there are any differences in the scores of each task by vocabulary size. In addition, I also calculated effect sizes of the differences to interpret their degrees referring to Mizumoto (2010). This was because an effect size is a standardized index that shows the degree of the difference found among the results of a statistical analysis and does not vary with sample size, unlike the p-value (Mizumoto & Takeuchi, 2008). Therefore, it is reasonable to compare the degree of differences by vocabulary size in light of their effect sizes. Note that when comparing the result of the mean comparison with that of ANOVA, one should regard the latter as a result where a difference between the vocabulary-size groups was equalized.

5.1.3 Results

5.1.3.1 Vocabulary-Size and Reading-Proficiency Tests

Table 5.1 summarizes the results of the vocabulary-size test. Participants whose estimated vocabulary size was greater than the median (*Mdn* = 3308) were allotted into the larger vocabulary size group (*n* = 30) and the rest into the smaller vocabulary size group (*n* = 33). The results of the *t* test revealed a statistically significant difference between the means of the two groups: $t(61) = 10.45$, $p < .001$, $d = 2.64$. Moreover, the results of another *t*-test confirmed that participants' vocabulary size performance was not significantly different in the versions of the lexical-inferencing task: $t(61) = 0.11$, $p = .912$, $d = 0.03$. This means that the difference in the task booklets has nothing to do with the interpretation of the following results related to vocabulary size.

Table 5.1

Descriptive Statistics of the Vocabulary-Size Test in Experiment 4

Vocabulary size	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Larger	30	3916.77	[3760.10, 4073.44]	419.57	3385	4808
Smaller	33	2606.12	[2408.09, 2804.15]	558.48	1269	3308
Total	63	3230.24	[3022.76, 3437.72]	823.84	1269	4808

Table 5.2 summarizes the results of the reading-proficiency test. Participants who scored higher than the median (*Mdn* = 7) were allotted into the group with higher reading proficiency (*n* = 28) and the rest into the group with lower reading proficiency (*n* = 35). The results of the *t* test revealed a statistically significant difference between the means of the two groups: $t(61) = 11.38$, $p < .001$, $d = 2.89$. In addition, the results of another *t*-test confirmed that participants' reading proficiency performance was also not

significantly different in the versions of the lexical-inferencing task: $t(61) = 1.19$, $p = .239$, $d = 0.30$. This confirms that the difference in the task booklets does not need to be considered when interpreting the results related to reading proficiency.

Table 5.2

Descriptive Statistics of the Reading-Proficiency Test in Experiment 4

Proficiency	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Higher	28	9.75	[9.19, 10.32]	1.46	8	13
Lower	35	5.00	[4.39, 5.61]	1.78	2	7
Total	63	7.11	[6.38, 7.84]	2.89	2	13

Note. The maximum possible score was 26.

5.1.3.2 Lexical-Inferencing Task and Learning-Confirmation Test

Tables 5.3 and 5.4 provide the descriptive statistics of the scores for the lexical-inferencing task and learning-confirmation test summarized in terms of vocabulary size and reading proficiency. Figures 5.4 and 5.5 visualize these statistics.

The ANOVA yielded a significant Prefix availability × Contextual informativeness × Task interaction: $F(1, 62) = 4.46$, $p = .039$, $\eta^2 = .00$. To interpret the observed interaction, I administered post-hoc tests. The results showed a significant simple interaction between contextual informativeness and task under the + prefix condition, $F(1, 124) = 9.41$, $p = .003$, $\eta^2 = .55$, and marginally significant simple interaction between prefix availability and task under the + informative condition, $F(1, 124) = 3.18$, $p = .077$, $\eta^2 = .17$. The post-hoc tests demonstrated a significant simple-simple main effect of Prefix availability under the + informative lexical-inferencing task condition, $F(1, 248) = 6.86$, $p = .009$, $\eta^2 = .05$, and – informative learning confirmation condition, $F(1, 248) = 6.82$, $p = .010$, $\eta^2 = .05$.

Furthermore, a marginally significant simple-simple main effect of Prefix availability under the – informative, lexical-inferencing task condition was evident, $F(1, 248) = 2.80$, $p = .095$, $\eta^2 = .02$. Moreover, simple-simple main effects for task were found under all Prefix availability × Contextual informativeness conditions, + Prefix + Informative, $F(1, 248) = 60.55$, $p < .001$ $\eta^2 = .36$; + Prefix – Informative, $F(1, 248) = 18.01$, $p < .001$, $\eta^2 = .11$; – Prefix + Informative, $F(1, 248) = 34.02$, $p < .001$ $\eta^2 = .20$; and – Prefix – Informative, $F(1, 248) = 28.04$, $p < .001$, $\eta^2 = .17$.

Regarding differences by vocabulary size, which could not be shown by the results of the ANOVA, I compared the means and 95% CIs of the two vocabulary size groups of the scores for the lexical-inferencing task and learning-confirmation test. The overall scores irrespective of the conditions and tasks (i.e., inferencing and learning) were found to differ significantly for participants' vocabulary size. The mean of the group with a larger vocabulary size ($M = 0.45$) was not within the 95% CI of the mean of the group with a smaller one (95% CI = [0.20, 0.36]). Furthermore, the mean of the group with a smaller vocabulary size ($M = 0.28$) was also outside the 95% CI of the mean of the group with a larger vocabulary (95% CI = [0.38, 0.53]). The effect size of this difference is large ($d = 0.79$). An examination of this difference under the four conditions revealed significant differences between the two vocabulary size groups in the scores for the lexical-inferencing task under the + Prefix + Informative (the smaller: $M = 0.48$, 95% CI = [0.32, 0.64]; the larger: $M = 0.74$, 95% CI = [0.57, 0.93]; $d = 0.57$) and + Prefix – Informative conditions (the smaller: $M = 0.42$, 95% CI = [0.24, 0.59]; the larger: $M = 0.63$, 95% CI = [0.47, 0.78]; $d = 0.59$). Moreover, the comparison of the means identified significant differences between vocabulary size in the scores for the lexical-inferencing task (the smaller: $M = 0.38$, 95% CI = [0.27, 0.49]; the larger: $M = 0.55$, 95% CI = [0.45, 0.65]; $d = 0.59$) and learning-confirmation test (the smaller: $M = 0.13$, 95% CI = [0.08,

0.19]; the larger: M = 0.24, 95% CI = [0.15, 0.33]; d = 0.53) under the + Prefix + Informative condition. In addition, a significant difference by vocabulary size was indicated in the score for the lexical-inferencing task under the – Prefix – Informative condition (the smaller: M = 0.32, 95% CI = [0.23, 0.40]; the larger: M = 0.55, 95% CI = [0.42, 0.68]; d = 0.79). Note that although the mean of the group with a smaller vocabulary size was within the 95% CI of the mean of the group with a larger vocabulary size in the + Prefix + Informative learning-confirmation test (the smaller: M = 0.14, 95% CI = [0.03, 0.25]; the larger: M = 0.33, 95% CI = [0.14, 0.51]; d = 0.47), the former mean is almost outside the latter's 95% CI. Thus, a marginally significant difference between them is presumed.

Following vocabulary size, I examined differences according to the reading proficiency groups comparing the means and 95% CIs. The results of the comparison revealed that reading proficiency did not have a significant effect on the overall scores across all conditions and tasks. The mean of the group with higher reading proficiency (M = 0.39) was within the 95% CI of the mean of the group with lower reading proficiency (95% CI = [0.26, 0.42]). Furthermore, the mean of the group with lower reading proficiency (M = 0.34) was also within the 95% CI of the group with higher reading proficiency (95% CI = [0.30, 0.48]), resulting in a small effect size (d = 0.22). However, note that a significant difference is evident by reading proficiency in the score of the lexical-inferencing task under the – Prefix – Informative condition (the smaller: M = 0.35, 95% CI = [0.27, 0.43]; the larger: M = 0.53, 95% CI = [0.38, 0.67]; d = 0.62).

Table 5.3

Descriptive Statistics of the Lexical-Inferencing Task and the Learning-Confirmation Test in Experiment 4 (Vocabulary Size)

		Prefix-available condition								Prefix-unavailable condition							
		More informative condition				Less informative condition				More informative condition				Less informative condition			
		Inference		Retention		Inference		Retention		Inference		Retention		Inference		Retention	
Vocabulary size	*n*	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Larger	30	0.74 (0.49)	[0.57, 0.93]	0.33 (0.50)	[0.14, 0.51]	0.63 (0.41)	[0.47, 0.78]	0.37 (0.52)	[0,18, 0.58]	0.55 (0.26)	[0.45, 0.65]	0.24 (0.25)	[0.15, 0.33]	0.55 (0.34)	[0.42, 0.68]	0.20 (0.24)	[0.11, 0.29]
Smaller	33	0.48 (0.46)	[0.32, 0.64]	0.14 (0.29)	[0.03, 0.25]	0.42 (0.50)	[0.24, 0.59]	0.26 (0.47)	[0.09, 0.42]	0.38 (0.31)	[0.27, 0.49]	0.13 (0.16)	[0.08, 0.19]	0.32 (0.24)	[0.23, 0.40]	0.15 (0.22)	[0.07, 0.23]
Total	63	0.60 (0.49)	[0.48, 0.73]	0.23 (0.41)	[0.13, 0.33]	0.52 (0.47)	[0.40, 0.64]	0.31 (0.50)	[0.19, 0.44]	0.46 (0.30)	[0.39, 0.54]	0.18 (0.21)	[0.13, 0.24]	0.43 (0.31)	[0.35, 0.51]	0.17 (0.23)	[0.11, 0.23]

Note. *Inference* refers to performance on the lexical-inferencing task, *Retention* indicates performance on the learning-confirmation test, the maximum possible score was 2.00.

Table 5.4

Descriptive Statistics of the Lexical-Inferencing Task and the Learning-Confirmation Test in Experiment 4 (Reading Proficiency)

		Prefix-available condition								Prefix-unavailable condition							
		More informative condition				Less informative condition				More informative condition				Less informative condition			
		Inference		Retention		Inference		Retention		Inference		Retention		Inference		Retention	
Reading Proficiency	*n*	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Higher	28	0.71 (0.53)	[0.51, 0.92]	0.28 (0.49)	[0.09, 0.47]	0.59 (0.44)	[0.42, 0.76]	0.23 (0.46)	[0.05, 0.40]	0.47 (0.25)	[0.37, 0.56]	0.18 (0.20)	[0.10, 0.25]	0.53 (0.37)	[0.38, 0.67]	0.17 (0.27)	[0.07, 0.27]
Lower	35	0.52 (0.45)	[0.36, 0.67]	0.19 (0.34)	[0.07, 0.31]	0.46 (0.49)	[0.29, 0.63]	0.39 (0.53)	[0.20, 0.57]	0.46 (0.34)	[0.34, 0.58]	0.19 (0.23)	[0.11, 0.27]	0.35 (0.24)	[0.27, 0.43]	0.18 (0.21)	[0.10, 0.25]
Total	63	0.60 (0.49)	[0.48, 0.73]	0.23 (0.41)	[0.13, 0.33]	0.52 (0.47)	[0.40, 0.64]	0.31 (0.50)	[0.19, 0.44]	0.46 (0.30)	[0.39, 0.54]	0.18 (0.21)	[0.13, 0.24]	0.43 (0.31)	[0.35, 0.51]	0.17 (0.23)	[0.11, 0.23]

Note. *Inference* refers to performance on the lexical-inferencing task, *Retention* indicates performance on the learning-confirmation test, the maximum possible score was 2.00.

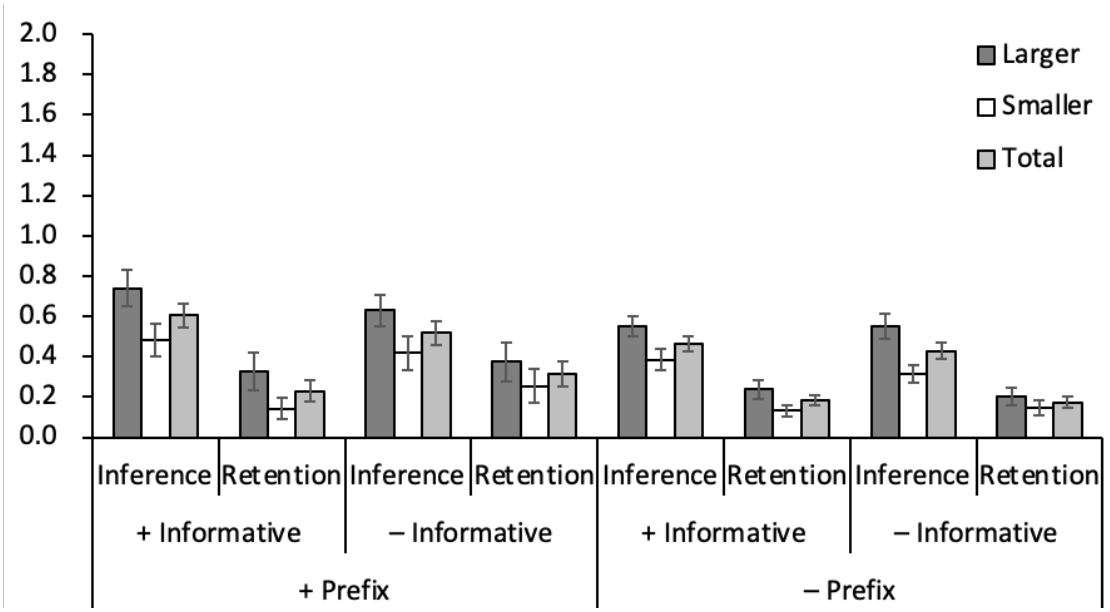


Figure 5.4. The scores of the lexical-inferencing task (Inference) and learning-confirmation test (Retention) in Experiment 4 by vocabulary size groups (Larger: n = 30; Smaller: n = 33; Total: N = 63). +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition. The maximum possible score was 2.00. (± standard errors)

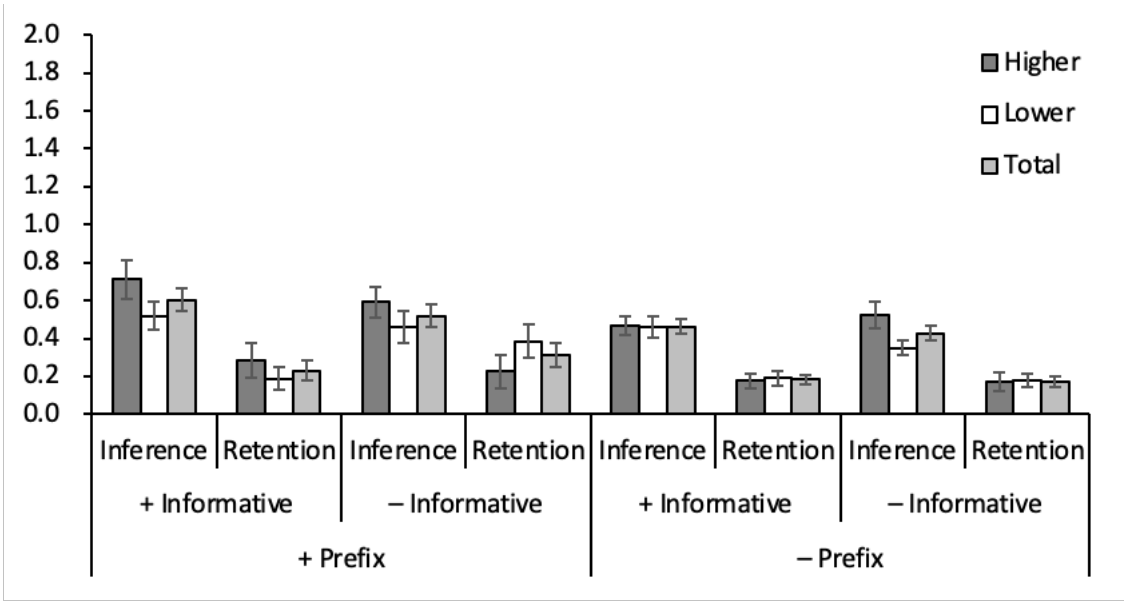


Figure 5.5. The scores of the lexical-inferencing task (Inference) and the learning-confirmation test (Retention) in Experiment 4 by reading-proficiency groups (Higher: n = 28; Lower: n = 35; Total: N = 63). +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition. The maximum possible score was 2.00. (± standard errors)

5.1.4 Discussion

5.1.4.1 Overview of Retention of Inferred Word Meaning

The analysis of the scores for the lexical-inferencing task and learning-confirmation test showed several simple-simple main effects. First, the simple-simple main effects of task found under all Prefix availability × Contextual informativeness conditions indicate that not all target words were retained in a week. The descriptive statistics show that approximately one third or half the target words inferred were retained after a week (see Tables 5.3 and 5.4, and Figures 5.4 and 5.5). The results of the present study are aligned with the findings of earlier L2 research (Webb, 2008). Webb reported that inferring word meaning resulted in retaining approximately 13% of the new words. The results of the present study and Webb (2008) indicate that the efficacy of learning vocabulary through lexical inferencing is naturally not high, but inferred word meaning can be retained to some extent.

5.1.4.2 Effect of Morphological and Contextual Clues and Learner Proficiency on Lexical Inferencing (RQ 4-1, RQ4-3)

Morphological and contextual clues. The analysis also yielded a simple-simple main effect of prefix availability on the scores of the lexical-inferencing task in the + informative condition and a marginally significant simple-simple main effect on the scores of the lexical-inferencing task under the – informative condition. However, it is premature to conclude that prefix availability had a positive effect on the score for the lexical-inferencing task irrespective of contextual informativeness. This is because the *p* value is close to .10 ($p = .095$) and the effect size is small ($\eta^2 = .02$). These statistical values indicate that discussing the effect of prefix availability based on this simple-simple main effect possibly causes Type I error, which occurs when a statistical test rejects a null

hypothesis although the hypothesis is true. To avoid this risk, I do not discuss this marginally significant simple-simple main effect only, but interpret it together with other results later.

Returning to the subject, the results of the ANOVA showed that prefix availability had a simple-simple main effect on the scores of the lexical-inferencing task under the + informative condition. Together with the mean scores, this result indicates that prefix availability had a positive effect on the score for the lexical-inferencing task when the context sentence was informative for word meaning.

However, this result can be interpreted in two ways. First, if the context sentence was informative enough to infer word meaning, participants may have used morphological clues in the target word, resulting in better inference. Second, even if the context sentence was informative enough to infer word meaning, participants could not infer word meaning using the informative context only to rely on morphological clues (i.e., prefixes).

If the former reading is considered better, I can state that in addition to the benefit of prefix availability, the present experiment revealed that contextual informativeness possibly affected participants' use of morphological clues, which reinforces Hamada's (2014) findings. Hamada compared the conditions wherein ESL learners could rely on word part and contextual information, and on contextual information but not on word part. Learners who had higher English proficiency switched from morphological to contextual clue types, leading to better inference performance. However, Hamada did not set up a condition under which learners could rely on neither morphological nor contextual clues. The present study added to Hamada's results a new finding that L2 learners' use of morphological information may also be affected by contextual information in addition to their English proficiency.

Vocabulary size. The key to switching in-text clues was ESL learners' English proficiency, but the explanation of the results of this experiment does not consider learner proficiency. Thus, for a fairer comparison of the results of this experiment and that of Hamada (2014), I closely examined differences in participants' performance on the lexical-inferencing task in light of vocabulary size and reading proficiency.

The results of the mean comparison revealed that the overall score differs significantly in terms of vocabulary size, and this difference is large enough to consider according to the effect size ($d = 0.79$). According to the comparison of the scores for the lexical-inferencing task, participants with a larger vocabulary size outperformed those with a smaller vocabulary size when the prefixes of target words were known to them (i.e., + prefix + informative, + prefix – informative conditions). The results under the + prefix + informative condition are inconsistent with those of Hamada (2014). She reported that ESL learners' general English proficiency did not make a significant difference in inference performance when both morphological and contextual information were reliable enough to infer the meanings of target words. In contrast, the results of this experiment revealed a significant, middle–large-size difference ($d = 0.57$) between vocabulary size in lexical inferencing under the + Prefix + Informative condition, which is the same situation as that stated above in Hamada. Moreover, a significant, middle-size difference ($d = 0.46$) was found in the scores on the lexical-inferencing task in the + Prefix – Informative condition, which Hamada (2014) did not examine. The effect sizes of these differences cannot be ignored. Considered together, these facts suggest that the more vocabulary EFL learners gain, the easier they can make an informed guess on word meaning if they know the word's prefix.

The inconsistency between the results of this experiment and that of Hamada (2014) can be explained by a difference in the measurements used to test learners' L2

proficiency. Hamada (2014) used an ESL test from the ACT Compass to measure her participants' English proficiency. In her paper, Hamada (2014) explains that the ACT Compass "offers standardized tests for postsecondary institutions in various subject areas, including reading, writing, and math, in addition to ESL" (p. 997). Although she did not detail its test battery, the test seems to measure test takers' integrated English ability such as reading and writing. This renders the following reasonable: Hamada could not observe the effect of learner proficiency on lexical inferencing performance because the ESL learners were divided into four groups according to their general English proficiency, which made it impossible to find the effects of individual English ability skills on inferencing. Note that it is unclear whether the test Hamada used included a subtest that measured test takers' vocabulary proficiency. On the other hand, this experiment adopted the vocabulary-size test, which was developed to measure the size of Japanese EFL learners' receptive vocabulary knowledge. In addition, I set the condition where the morphology in target words is available, but contextual information is not reliable (i.e., + Prefix – Informative condition), which was not set in Hamada's study. In doing so, this experiment succeeded in revealing the effect of vocabulary size on lexical inferencing using prefix knowledge irrespective of contextual informativeness. To conclude, the examination of the mean scores deepens understanding of the relationship between learner proficiency and inferencing performance by EFL learners. The breadth of L2 vocabulary knowledge plays an important role in lexical inferencing using morphology in a word.

Another significant difference with a middle effect size (d = 0.59) between the vocabulary size groups was found in the scores for the lexical-inferencing task in the case when the context of the sentences were informative but the prefix clues were not (i.e., – prefix + informative condition). This result is aligned with that of Hamada (2014). In her

study, ESL learners with high English proficiency succeeded in inferencing more than did those with low English proficiency when in-word clues were unreliable and contextual information was reliable. To explain this result, Hamada analyzed the selectivity of the choices of the multiple-choice lexical-inferencing task, and reasoned as follows. Low-proficiency learners tended to be stuck on morphemes in target words even though they were not reliable, and would not use the contextual information, leading to failure in inferencing. High-proficiency learners paid attention to and used contextual information, resulting in successful inferencing. This explanation may be applicable to the results of this experiment. That is, when the prefixes in the target words were not available and sentence context was informative for inferencing, the participants with a smaller vocabulary size would or could not use contextual information and had difficulty inferring word meaning. However, those with a larger vocabulary size paid attention to sentence context so much that they could switch the clues they relied on and were likely to achieve successful inferencing.

Another significant difference with a large effect size (d = 0.79) was surprisingly identified in the score for lexical inferencing under the – prefix – informative condition. This result obviously contradicts the discussion thus far. One possible explanation for this result is that when neither prefix nor contextual information was reliable for inferencing, participants with a large vocabulary size may have noticed the unreliability of the two in-text clues and made informed guesses on the target word by changing the inferential strategies or clues they relied on to out-text resources such as background knowledge. This possibility needs to be explored in further research or compared with past research using the online method (e.g., think-aloud method).

Reading proficiency. In contrast with vocabulary size, reading proficiency was found to make little difference to the entire score (d = 0.22), except under the – prefix –

informative condition. Furthermore, the group with higher reading proficiency outperformed the group with lower proficiency when neither prefix nor contextual information was useful for inferencing (d = 0.62). This can be attributed to the following two points. First, the reliability of the reading-proficiency test was low (Cronbach's α = .39), meaning that the examination of inferencing performance in light of the reading proficiency groups may not necessarily reflect participants' potential reading proficiency. Second, the experimental passages adopted in this experiment were adjusted for participants (i.e., university students) based on their word and grammar levels. Therefore, reading proficiency made little difference when participants read the passages.

Interestingly, this result is aligned with that for vocabulary size (d = 0.79). This can be interpreted as follows: The reading proficiency and vocabulary size measured in this experiment together play a role in lexical inferencing using clues other than in-text ones (i.e., prefix and contextual information). To conclude, reading proficiency may not have been involved in lexical inferencing using morphological and contextual information as a result of the mean comparison in light of reading proficiency. There is also a possibility that the reading proficiency measured in this experiment may have been involved with lexical inferencing using clues outside the text and vocabulary size.

Summary. To sum up, the results of the lexical-inferencing task demonstrated the interaction between prefix and contextual information (answer to RQ 4-1). However, the effect of each clue was found to be dependent on EFL learners' proficiency, especially vocabulary size, as shown below. First, L2 vocabulary size contributes to lexical inferencing using prefix knowledge irrespective of contextual informativeness. Second, L2 learners with a larger vocabulary size can use contextual clues to infer word meaning, while those with a smaller vocabulary size cannot (Answer to RQ 4-3).

Based on these findings, the significant and marginally significant differences of

Prefix availability indicated by the ANOVA can be explained as follows. The score for the lexical-inferencing task was higher under the + prefix +informative condition than the – prefix + informative one because participants could use the prefix information regardless of their vocabulary size. Thus, prefix availability rather than contextual information weighed considerably with their inference. In contrast, participants with a smaller vocabulary size had difficulty using contextual information under the – prefix + informative condition and thus lowered the overall score (cf. Hamada, 2014). As such, the score was lower than under the + prefix + informative condition as a result of the ANOVA, where the difference in vocabulary size was averaged. In addition, the higher score attained by the group with a larger vocabulary size can likely be attributed to high morphological awareness (Zhang & Koda, 2012). Zhang and Koda showed that morphological awareness indirectly contributes to the growth of vocabulary knowledge. Thus, having a large vocabulary can be regarded as having better morphological awareness. Finally, the simple-simple main effect of Prefix availability on the scores of the lexical-inferencing task under the – informative condition was marginally significant, meaning a very weak tendency. The weakness of this effect possibly reflects that participants with a smaller vocabulary size made better informed guesses based on prefix clues, which are easier to use than context, under the + prefix – informative condition than the – prefix – informative one.

Current models on L2 lexical inferencing hold that L2 learners combine different types of clues to make informed guesses (de Bot et al., 1997; Huckin & Bloch, 1993). Based on this idea and the finding from the present study, it is argued that learner proficiency—especially the breadth of vocabulary knowledge—affects this processing of combining clues, rather than being affected by each clue.

5.1.4.3 Effect of Morphological and Contextual Clues and Learner Proficiency on Retention of Inferred Word Meaning (RQ 4-2, RQ4-3)

Morphological and contextual clues. Besides lexical inferencing, the analysis revealed that prefix availability also had a simple-simple main effect on retention of inferred word meaning under the – informative condition. This result, taken together with the mean scores, indicates that when the context sentence was not informative for word meaning, prefix availability had a positive influence on the score of the learning confirmation task given a week after the lexical-inferencing task (Answer to RQ 4-2). This complicated result can be explained based on the fact that it was probably more demanding for participants to infer word meaning under the – informative condition than in the + informative condition, and participants could only rely on prefix clues in the target words. This may have required them to pay more attention to word forms, leading to a more elaborate representation of form-meaning mapping. This explanation is aligned with arguments in previous research (Haastrup, 1991; Laufer, 2003). Easily inferred word meaning is not easily retained. Another possible explanation for this result is that because participants could only rely on morphological clues, they may have paid more attention to the forms of target words than to contextual information. Thus, participants recalled inferred word meaning better under the less informative condition than in the more informative condition.

Vocabulary size. The explanation above enhances understanding of the overall relationship between retention of inferred word meaning and in-text clues. To deepen this understanding, I elucidate differences in the scores of the learning-confirmation test in terms of learner proficiency, as with the case of lexical inferencing,

As stated in the previous section, a significant difference in the middle effect size (d = 0.59) between the vocabulary size groups was found in the scores for the lexical-

inferencing task when the contexts of the sentences were informative but prefix clues were not (i.e., – prefix + informative condition). Interestingly, although the degree thereof was slightly alleviated, the difference in the size of this middle effect was also found in the score for the learning-confirmation test under the same condition (d = 0.53). In contrast, this difference between the vocabulary size groups was not found under the + prefix + informative or + prefix – informative learning-confirmation tests, although under these two conditions, the group with a larger vocabulary size outperformed that with the smaller one in the scores for the lexical-inferencing task.

The difference in the attrition between inferencing and learning can also be explained by the idea that easily inferred word meaning is not easily retained, as noted in previous studies (Haastrup, 1991; Laufer, 2003). Participants with a larger vocabulary size used contextual clues well to infer word meaning; thus, they performed better than the group with a smaller vocabulary size, and this was not demanding for them. However, the low task demand may have made it difficult for them to retain inferred word meaning. This reasoning could explain the simple-simple main effect of prefix availability on retention without an informative context. The results of the ANOVA demonstrated a better score in the + prefix – informative than in the – prefix – informative learning-confirmation tests, but no difference was evident between vocabulary size under this condition. As discussed above, under the + prefix – informative condition, participants were able to rely on in-word clues irrespective of vocabulary size; thus, participants with a smaller vocabulary size were allowed to pay attention to the morphological information to make inferences. At the same time, the group with a larger vocabulary size likely noticed the unavailability of contextual information and consciously focused on in-word clues more to infer word meaning. These two reasons highlight one consequence, namely that retention is better through lexical inferencing regardless of vocabulary size.

However, note that the score of the group with a larger vocabulary size was almost significantly better than that of the group with the smaller vocabulary size, which had an almost middle effect size (d = 0.47). This marginal significance suggests that vocabulary cannot be learned through lexical inferencing unless L2 learners succeed in inferring word meaning, as Laufer (2003) argues. That is, the successfulness of inference is fundamental, and consequently its increase would affect the amount of retention. Therefore, the scores of the group with a larger vocabulary size, who could enjoy their morphological awareness, indicated more successful inference than achieved by their counterparts. This superiority was possibly reflected as the marginal significance in question, which is a substantially significant difference.

In contrast to the case of available prefixes, under the – prefix + informative condition, participants with a smaller vocabulary size could hardly use any in-text clues. It was difficult for them to infer word meaning, and they only retained a few of these. On the other hand, participants with a larger vocabulary size switched the clues they relied on to contextual ones to achieve successful inferencing, resulting in better inference and retention. Based on this reasoning, it is suggested that switching clues to infer word meaning is part of lexical-inferencing processing and demanding enough to lead to the retention of the inferred word meaning. Moreover, the discussion thus far indicates that performing this processing requires learners to have a sufficient vocabulary size.

However, the results of the ANOVA did not show the contribution of contextual information to retention of inferred word meaning, which is a main effect of contextual informativeness on the learning-confirmation test. The lack of this main effect can be explained in light of the relationship between reading proficiency and task, as discussed below.

Reading Proficiency. In contrast to vocabulary size, differences between the two

reading proficiency groups were not found in the learning-confirmation test under the four conditions. Tables 5.3 and 5.4 and Figures 5.4 and 5.5 statistically and visually illustrate that the tendency of the scores summarized for reading proficiency is not consistent with that of vocabulary size. Specifically, regarding vocabulary size, the scores for both the lexical-inferencing task and learning-confirmation test by groups with a larger vocabulary size were consistently higher than those of the groups with a smaller vocabulary size regardless of statistical significance. However, the superiority of the group with higher reading proficiency is not entirely consistent. The scores of the group with lower proficiency were better than those of the group with higher proficiency in the + prefix – informative, and – prefix + informative learning-confirmation tests irrespective of statistical significance. Moreover, the difference between the two reading proficiency groups in the scores on the lexical-inferencing task was not found in the scores for the learning-confirmation test. Taken together, these results indicate that reading proficiency had nothing to do with vocabulary learning through lexical inferencing using morphological and contextual clues. Based on this disappearance of the difference between inferencing and retention and the reasoning above, it is suggested that the reading proficiency measured in this experiment may have involved lexical inferencing using clues outside the text as well as vocabulary size. However, this way of inferencing did not necessarily require a burden demanding enough to ensure that participants with high proficiency retained inferred word meaning.

I discussed the contribution of contextual informativeness to retention of word meaning in the previous section on the effect of vocabulary size, but the results of the ANOVA did not confirm the existence of the effect. This lack of an effect can be attributed to the tendency of reading proficiency, as explained below. The tendency of the scores by the two reading proficiency groups differs from that of the vocabulary size groups,

especially under the − prefix + informative condition. Therefore, these two tendencies may have "disappeared" together (i.e., the effect of vocabulary size may have been equalized by the result of reading proficiency).

Summary. In conclusion, the results of the ANOVA demonstrated the interaction between prefix availability and contextual informativeness on the retention of target word meaning (Answer to RQ 4-2). As with the case of lexical inferencing, this interaction can be affected by learner proficiency. The comparison of the scores of the learning-confirmation test in terms of learner proficiency revealed that (a) learners with a large vocabulary size switched the clues they relied on for inferencing to contextual information when the prefixes in the target words were not known to them. This enabled them to make more successful guesses on word meaning and to better retain inferred word meaning. (b) For learners with a smaller vocabulary size, the prefixes available to them possibly attracted their attention so much that they recalled word meaning better than in the prefix-unavailable case (Answer to RQ 4-3).

5.1.5 Summary of Experiment 4

Experiment 4 explored how vocabulary learning through lexical inferencing among Japanese EFL university students was affected by clues available in text and learner proficiency, focusing on morphology and contextual informativeness. The experiment revealed two key outcomes regarding overall performance. First, EFL learners inferred word meaning better when unknown words contained prefixes they knew and the surrounding context was informative for inferring word meaning (Answer to RQ 4-1). Second, EFL learners retained inferred word meaning better a week after inferencing when unknown words had prefixes they knew and the context was not informative enough to infer word meaning (Answer to RQ 4-2). In addition, examining these results in light

of learner proficiency revealed that EFL learners with a large vocabulary can use morphological information efficiently and switch clue types from morphological to contextual, leading to better inference and retention performance (Answer to RQ 4-3).

The findings of previous studies enabled me to make two predictions. One is that if L2 learners are given morphological and contextual clues, it will be easier to infer word meaning than without any informative clues, facilitating incidental vocabulary learning. The second is that when both types of clues are available to L2 learners, it will be easier for them to infer word meaning, but they may pay less attention to unknown words, resulting in more difficulty in the retention of inferred word meaning. The former prediction is aligned with the overall results of the lexical-inferencing task, although the results of the learning-confirmation test did not show any benefits of having the two available clues. The latter prediction partially accounts for the retention of inferred word meaning. To summarize, for further research on vocabulary learning through lexical inferencing, it is necessary to consider the degree of effort for inferring word meaning and the fact that learners' vocabulary proficiency governs the flexible use of in-text clues, which is an important part of lexical-inferencing processing.

5.2 Experiment 5: Examining Retention of Inferred L2 Word Meaning Based on Morphological and Contextual Clues and Learner Proficiency: Recall Based on Context

5.2.1 Purpose and Research Questions of Experiment 5

Experiment 4 explored the effects of the use of morphological and contextual clues and learner proficiency on vocabulary learning through lexical inferencing. The results showed the contribution of both prefix availability and contextual information to lexical inferencing and subsequent retention by EFL learners, and that the ability to use

contextual information to infer word meaning can be influenced by learners' vocabulary knowledge.

Although this experiment has deepened our understanding of the relationship between in-text clues, learner proficiency, and vocabulary learning though lexical inferencing, some limitations remain. The limitations can be summarized as the following three points. First, the spelling of the target word was presented to participants in the learning-confirmation test in Experiment 4. This may have led to a situation where participants did not recall the inferred word meaning, but rather, instantaneously inferred the meaning while working on the learning confirmation task. Although I told participants that they could leave items unanswered if they could not recall the inferred word meaning, this possibility cannot be rejected. Experiment 4 should be replicated using a different test that does not provide word form (e.g., presenting an experimental passage to participants with the target word replaced with parentheses). Second, participants' reading proficiency could not be measured with high reliability. To confirm whether the result with low reliability was due to a difference in the test itself or the participants, I assigned the same reading-proficiency test as in Experiment 4 to different university students who had not participated in the previous experiments. Third, I could not employ participants' English vocabulary size and reading proficiency as factors in the ANOVA because of a statistical limitation. When I input participants' proficiency, a measured vocabulary-size test, and reading-proficiency test into the ANOVA, homoscedasticity was not fulfilled. Thus, I administered two ANOVAs that included the following factors: Prefix availability, contextual informativeness, task (i.e., inferencing and retention), and learner proficiency (i.e., vocabulary size and reading proficiency, respectively). The ANOVAs were expected to reinforce the plausibility of the discussion developed through Experiment 4.

In addition to the abovementioned limitations, I aimed to examine the effect on

vocabulary learning of providing EFL learners with target word meaning after inferencing. Mondria (2003) reported the effectiveness of this intervention. This study compared three conditions to investigate the learning efficacy of vocabulary learning through lexical inferencing. The results of the vocabulary test revealed that learners who looked up target words in a dictionary after they inferred the words outperformed those without any intervention after inferencing. This result clarified the possibility of an educational intervention by EFL educators who aim to improve their students' efficacy in learning vocabulary from the context. Therefore, Experiment 5 applied this intervention to vocabulary learning through lexical inferencing using prefix and contextual information under a condition where looking up the inferred word meaning would be more effective in terms of increasing retention.

Experiment 5 was conducted to replicate the results of Experiment 4 under a condition where university students could recall inferred word meaning based on contextual clues rather than the spelling of target words. In addition to the replication, this experiment also aimed to reveal the effect of looking up the inferred word meaning after inferencing on retaining word meaning. To address these purposes, I posed four RQs:

RQ 5-1: Do both morphological and contextual clues affect inferring word meaning by EFL university students in Experiment 5, as was in Experiment 4?

RQ 5-2: Do both morphological and contextual clues affect vocabulary learning through lexical inferencing in Experiment 5, where EFL university students recall inferred word meaning based on contextual clues; as was in Experiment 4?

RQ 5-3: Do L2 vocabulary size and reading proficiency of EFL university students affect vocabulary learning through lexical inferencing using morphological

and contextual clues in Experiment 5, as was in Experiment 4?

RQ 5-4: Does looking up the word meaning after inferencing facilitate vocabulary learning through lexical inferencing by EFL university students?

5.2.2 Method

5.2.2.1 Participants

In total, 104 undergraduates at a university in Japan (82 women and 22 men; average age = 19.33 years, range = 18–68 years) participated in this study. They weere students in nursing and psychology and welfare. Data from 25 students (13 women and 12 men) were excluded because they did not complete part of the experiment procedure. Thus, data from 79 students were ultimately analyzed.

To determine the participants' general English proficiency, I administered a questionnaire and asked them to report their scores on the EIKEN tests prior to the experiment. The result was as follows: Three participants held Grade 5, 1 held Grade 4, 12 held Grade 3, 21 held Grade Pre-2, and 13 held Grade 2, and the rest of participants (n = 29) did not report any grade of EIKEN. Based on responses to the questionnaire, participants' approximate general English proficiency was estimated to be between beginner and intermediate levels.

Students in a class (n = 27) were given an opportunity to check word meaning after engaging in the lexical-inferencing task. These students comprised the experimental group. The purpose was to investigate the effect of explicitly understanding inferred word meaning on retention. The rest of the students (n = 77) were not provided with any information of target words after the task; thus, these were the control group. For more detail, see Section 5.2.2.3.

5.2.2.2 Materials

In general, the materials used in this study were the same as those used in Experiment 4 except for a new learning-confirmation test. Therefore, this section only describes the new learning-confirmation test. See Section 5.1.2.2 for a description of the other materials (i.e., vocabulary-size test, reading-proficiency test, lexical-inferencing task, and prefix test.)

Learning-confirmation test. I created a learning-confirmation test based on the one used in Experiment 4 (Figure 5.6). The new test was developed to measure how many target words participants retain the meanings of based on the context sentences. For each item, a target word in the experimental passage was replaced with parentheses and followed by an answer field. The answer field had two check boxes to confirm whether participants had ever looked up the target word in their dictionary since the treatment in Week 1. In addition, a direction and an answer field asking participants to recall and write the target word spelling was added under the answer field for the meaning.

I heard a news story about a crime that happened this morning. The reporter said (　　) was spreading all over the town.

（　　）に入る語の意味を下の欄に日本語で記入してください。	以前，この単語の意味を調べましたか？
意味：	□はい　□いいえ
（　　）に入る語のつづりを下の欄に記入してください。	
つづり：	

Figure 5.6. Example of the learning-confirmation test in Experiment 5. The direction and question written in Japanese translates as follows: Direction in the upper column: “Write down the meaning of the word in parentheses in the blank space below in Japanese.” Question: “Did you look up the word before (this test)?” Choices: □ “Yes” □ “No.” Direction in the lower column: “Write down the spelling of the word in parentheses.”

5.2.2.3 Procedure

The procedure of Experiment 5 was essentially the same as that of Experiment 4, except for the presentation of the meanings of the target words. This experiment was conducted during part of a class period, and I had taken charge of three English courses with different university students (hereafter, Classes A, B, and C). Among these three classes, I set Class A as an experimental group (n = 27) and the other two as one control group (n = 52). Again, this division was to reveal the effect of looking up inferred word meaning after inferencing on the retention of word meaning (Mondria, 2003).

Figure 5.7 illustrates the procedure of Experiment 5. The differences between Experiments 4 and 5 were as follows. First, after the inferencing task, participants in the experimental group were given a list of target word meanings, while those in the control group were not. The list contained the target words beside their Japanese counterparts. In a previous study (Mondria, 2003), L2 learners looked up target words in a dictionary, but this was not done in this research because it was unrealistic for me to provide participants with the same dictionaries during the class period. Participants in both the experimental and control groups were not told that the learning-confirmation test would be assigned one week later.

The second difference was the instructions for the learning-confirmation test. One week after the lexical-inferencing task, participants were given the surprise learning-confirmation test. They were instructed to write the meaning of each target word replaced with parentheses in the answer field in Japanese and to check either box off to report if they had looked up the word in their dictionary. When instructing, I emphasized the following points: (a) The sentences were the same as those they read in the inferencing task one week ago, and (b) they were allowed to leave the item unanswered if they could not recall the word's meaning. This attempt was to avoid the situation where participants

did not recall the inferred word meaning, but instantaneously inferred it while working on the learning confirmation task.

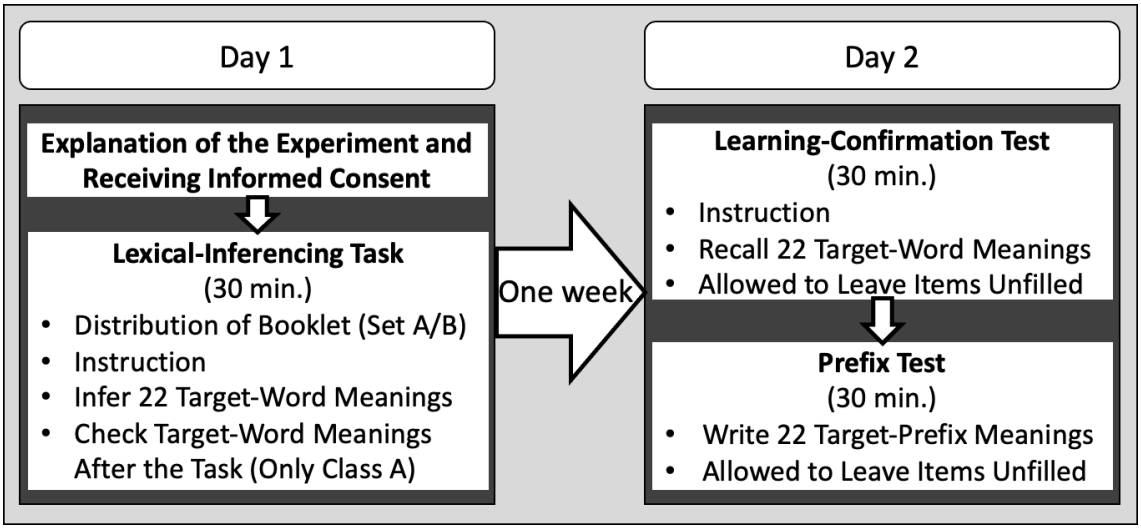


Figure 5.7. Procedure of Experiment 5. The vocabulary-size test and reading-proficiency test were administered prior to the experiment.

5.2.2.4 Scoring and Analyses

Vocabulary-size test and reading-proficiency test. Both of the two proficiency tests were scored as done in the precedent experiments. The reliability of the vocabulary-size test was sufficient (Cronbach's $\alpha = .98$), but that of the reading-proficiency test cannot be regarded as sufficient (Cronbach's $\alpha = .41$) as with that of the previous experiments.

Lexical-inferencing task. As with the previous experiment, participants' responses to the lexical-inferencing task were scored on a three-point scale (0: *unsuccessful*, 1: *partially successful*, 2: *successful*) referring to the previous studies (Nassaji, 2003, Ushiro et al., 2013).The scoring began with rating 30% of all responses to the task. Raters included a graduate student who had experience teaching English at junior and senior

high schools in Japan for more than 22 years, and me, who had experience teaching English at a Junior high school and universities for approximately three years in total. The inter-rater agreement was 96%, and discrepancies were resolved through discussion by the raters. Then, I scored the rest of the data (70%). Words that participants reported as known words and for which they wrote the correct meanings were excluded from analysis.

Learning-confirmation test. The scoring of participants' responses to the learning-confirmation test followed the scoring process as the lexical-inferencing task depicted above, and the raters were also the same. The inter-rater agreement was 91%, and discrepancies were resolved through discussion by the raters. Words that participants reported as known words and for which they wrote the correct meanings were excluded from analysis. Moreover, the responses to the target words of which participants failed to infer the meanings in the lexical-inferencing task were removed from the analysis.

Prefix task. The scoring and the raters for the prefix task were the same as the ones in the Experiment 4. The inter-rater agreement was 78%, and discrepancies were resolved through discussion by the raters. Finally, participants whose responses were rated as one were categorized as the prefix available condition, and those whose responses were rated as zero were classified in the prefix unavailable condition (+ prefix/– prefix conditions).

Statistical Analyses. To statistically investigate the relationship between clue types, word inferencing, retention of inferred word meaning, intervention after inferencing (i.e., lookup/non-lookup condition), and learner proficiency, I first conducted three 4-way ANOVAs of the scores for the lexical-inferencing task and learning-confirmation test. However, the results of Levene's test for the homogeneity of the variances conducted prior to the analyses revealed that the two vocabulary size groups were not homogeneous in the five conditions ($ps < .05$). Similarly, the results of another Levene's test showed that the two reading proficiency groups were not homogeneous for the scores on the

learning-confirmation test under the + prefix and + informative condition ($p < .001$). Furthermore, yet another Levene's test indicated that the lookup and non-lookup groups were not homogeneous in the three conditions (ps < .05). In this case, ANOVAs should be performed without the two learner factors (i.e., vocabulary size and reading proficiency). Therefore, I conducted a 2 (prefix availability: + prefix vs. – prefix [within]) × 2 (contextual informativeness: + informative vs. – informative [within]) × 2 (task: lexical-inferencing task vs. learning-confirmation test [within]) ANOVA of the scores for the lexical-inferencing task and learning-confirmation test.

To investigate effects of vocabulary size, reading proficiency, and intervention, I followed Plonsly' (2015) suggestions as with Experiment 4. Specifically, I interpreted the results of the two tasks by closely examining means, and 95% CIs. Again, when the mean of a group is not within the 95% CI of the other group and vice versa, I regarded the means of these two groups as significantly different from each other ($\alpha = .05$). Similarly, I also calculated effect sizes of the differences to interpret their degrees referring to Mizumoto (2010).

5.2.3 Results

5.2.3.1 Clues Available in Text and Learner Proficiency in Lexical Inferencing and Vocabulary Learning

Vocabulary-size and reading-proficiency tests. Table 5.5 summarizes the result of the vocabulary-size test. The participants whose estimated vocabulary size was greater than the median ($Mdn = 3308$) were allotted into the larger vocabulary group ($n = 40$), and the rest into the smaller vocabulary group ($n = 39$). The result of t test revealed a statistically significant difference between the means of the two groups, $t(77) = 15.18$, $p < .001$, $d = 3.42$. Moreover, another t-test result confirmed that the vocabulary-size

performance by the participants were not significantly different in the versions of the lexical-inferencing task, $t(77) = 0.24$, $p = .812$, $d = 0.05$, meaning that the difference of the task booklets has nothing to do with interpretation of the following results related to vocabulary size.

Table 5.6 summarizes the result of the reading-proficiency test. The participants whose score was greater than the median ($Mdn = 4$) were allotted into the higher group ($n = 40$), and the rest into the lower group ($n = 39$). The result of t test revealed a statistically significant difference between the means of the two groups, $t(77) = 11.76$, $p < .001$, $d = 2.65$. In addition, another t-test result confirmed that the reading-proficiency performance by the participants were also not significantly different in the versions of the lexical-inferencing task. $t(77) = 1.03$, $p = .304$, $d = 0.23$, ensuring that the difference of the task booklets needs no consideration when interpretating the following results related to reading proficiency.

Table 5.5

Descriptive Statistics of the Vocabulary-Size Test in Experiment 5

Vocabulary size	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Larger	40	3974.07	[3840.86, 4107.28]	416.51	3308	5038
Smaller	39	2385.67	[2220.36, 2550.97]	509.04	1154	3154
Total	79	3189.92	[2983.15, 3396.69]	923.13	1154	5038

Table 5.6

Descriptive Statistics of the Reading-Proficiency Test in Experiment 5

Proficiency	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Higher	40	4.90	[4.49, 5.31]	1.28	4	9
Lower	39	1.79	[1.45, 2.14]	1.06	0	3
Total	79	3.38	[2.93, 3.80]	1.95	0	9

Note. The maximum possible score was 26.

Lexical-inferencing task and learning-confirmation test. Tables 5.7 and 5.8 are the descriptive statistics of the scores on the lexical-inferencing task and the learning-confirmation test summarized in terms of vocabulary size and reading proficiency, and Figures 5.8 and 5.9 visualize them.

The Prefix availability × Contextual informativeness × Task ANOVA yielded a Prefix availability × Task interaction, $F(1, 78) = 8.77$, $p = .004$, $\eta^2 = .01$. However, the results of the ANOVA did not show any other interactions or main effects (ps > .05). To interpret the observed interaction, I administered a post-hoc test. The results showed a significant simple main effect of Prefix availability on the lexical-inferencing task, $F(1, 154) = 7.61$, $p = .007$, $\eta^2 = .02$. The post-hoc test also revealed a simple main effect of Task both under the + Prefix, $F(1, 154) = 181.45$, $p < .001$, $\eta^2 = .62$, and – Prefix conditions, $F(1, 154) = 103.07$, $p < .001$, $\eta^2 = .35$.

Regarding the difference by vocabulary size, which could not be shown by the results of the ANOVA, I compared the means and 95% CIs of the two vocabulary size groups of the scores for the lexical-inferencing task and learning-confirmation test. The overall scores irrespective of the conditions and tasks (i.e., inferencing and learning) were found to be significantly different in terms of participants' vocabulary size. Here, the

mean of the group with a larger vocabulary size (M = 0.40) was not within the 95% CI of the mean of the group with a smaller one (95% CI = [0.14, 0.22]). Furthermore, the mean of the group with a smaller vocabulary size (M = 0.18) was also outside the 95% CI of the mean of the group with the larger one (95% CI = [0.34, 0.46]). The effect size of this difference is large (d = 1.38). A closer examination of this difference under the four conditions showed that the significant difference between the two vocabulary size groups was so large that the scores of both the lexical-inferencing task and learning-confirmation test differed significantly between the two groups under all four conditions. The effect size of each significant difference by vocabulary size is as follows: Scores for the lexical-inferencing task under the + prefix + informative (d = 0.62), + prefix – informative (d = 0.74), – prefix + informative (d = 1.22), and – Prefix – Informative conditions (d = 1.16); and scores for the learning-confirmation test under the + prefix + informative (d = 0.74), + prefix – informative (d = 0.76), – prefix + informative (d = 0.65), and – Prefix – Informative conditions (d = 0.85).

Following the case of vocabulary size, I examined the differences according to the reading proficiency groups by comparing the means and 95% CIs. The results of the comparison revealed that reading proficiency did not have a significant effect on the overall scores across all conditions and tasks. The mean of the group with higher reading proficiency (M = 0.27) was within the 95% CI of the mean of the group with lower reading proficiency (95% CI = [0.26, 0.38]). Furthermore, the mean of the group with lower reading proficiency (M = 0.32) was also within the 95% CI of the group with higher reading proficiency (95% CI = [0.21, 0.33]), resulting in a small effect size (d = 0.24). In fact, no significant difference was found between the two reading proficiency groups in the scores for the lexical-inferencing task or learning-confirmation test under the four conditions.

Table 5.7

Descriptive Statistics of the Lexical-Inferencing Task and the Learning-Confirmation Test in Experiment 5 (Vocabulary Size)

		Prefix-available condition								Prefix-unavailable condition							
		More informative condition				Less informative condition				More informative condition				Less informative condition			
		Inference		Retention		Inference		Retention		Inference		Retention		Inference		Retention	
Vocabulary size	*n*	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Larger	40	0.66 (0.49)	[0.50, 0.81]	0.13 (0.22)	[0.06, 0.20]	0.73 (0.57)	[0.54, 0.91]	0.19 (0.30)	[0.10, 0.28]	0.62 (0.32)	[0.52, 0.72]	0.18 (0.23)	[0.11, 0.25]	0.57 (0.29)	[0.48, 0.66]	0.17 (0.19)	[0.11, 0.23]
Smaller	39	0.37 (0.44)	[0.23, 0.51]	0.01 (0.06)	[-0.01, 0.03]	0.36 (0.41)	[0.22, 0.49]	0.02 (0.10)	[-0.01, 0.06]	0.29 (0.21)	[0.22, 0.36]	0.06 (0.12)	[0.02, 0.10]	0.29 (0.18)	[0.23, 0.35]	0.04 (0.10)	[0.01, 0.08]
Total	79	0.51 (0.49)	[0.41, 0.62]	0.07 (0.17)	[0.03, 0.11]	0.54 (0.53)	[0.42, 0.66]	0.11 (0.24)	[0.24, 0.16]	0.46 (0.31)	[0.39, 0.53]	0.12 (0.19)	[0.08, 0.16]	0.43 (0.28)	[0.37, 0.49]	0.11 (0.16)	[0.07, 0.14]

Note. *Inference* refers to performance on the lexical-inferencing task, *Retention* indicates performance on the learning-confirmation test, the maximum possible score was 2.00.

Table 5.8

Descriptive Statistics of the Lexical-Inferencing Task and the Learning-Confirmation Test in Experiment 5 (Reading Proficiency)

		Prefix-available condition								Prefix-unavailable condition							
		More informative condition				Less informative condition				More informative condition				Less informative condition			
		Inference		Retention		Inference		Retention		Inference		Retention		Inference		Retention	
Reading Proficiency	*n*	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Higher	40	0.50 (0.49)	[0.35, 0.66]	0.04 (0.12)	[-0.00, 0.07]	0.47 (0.54)	[0.30, 0.65]	0.10 (0.23)	[0.03 0.17]	0.46 (0.32)	[0.35, 0.56]	0.10 (0.18)	[0.04, 0.15]	0.40 (0.27)	[0.32, 0.49]	0.10 (0.16)	[0.05, 0.15]
Lower	39	0.53 (0.49)	[0.37 0.69]	0.11 (0.20)	[0.04, 0.18]	0.61 (0.51)	[0.45, 0.78]	0.11 (0.25)	[0.03, 0.19]	0.46 (0.31)	[0.36, 0.56]	0.14 (0.20)	[0.08, 0.21]	0.46 (0.29)	[0.37, 0.55]	0.12 (0.16)	[0.06, 0.17]
Total	79	0.51 (0.49)	[0.41, 0.62]	0.07 (0.17)	[0.03, 0.11]	0.54 (0.53)	[0.42, 0.66]	0.11 (0.24)	[0.05, 0.16]	0.46 (0.32)	[0.39, 0.53]	0.12 (0.19)	[0.08, 0.16]	0.43 (0.28)	[0.37, 0.49]	0.11 (0.16)	[0.07, 0.14]

Note. *Inference* refers to performance on the lexical-inferencing task, *Retention* indicates performance on the learning-confirmation test, the maximum possible score was 2.00.

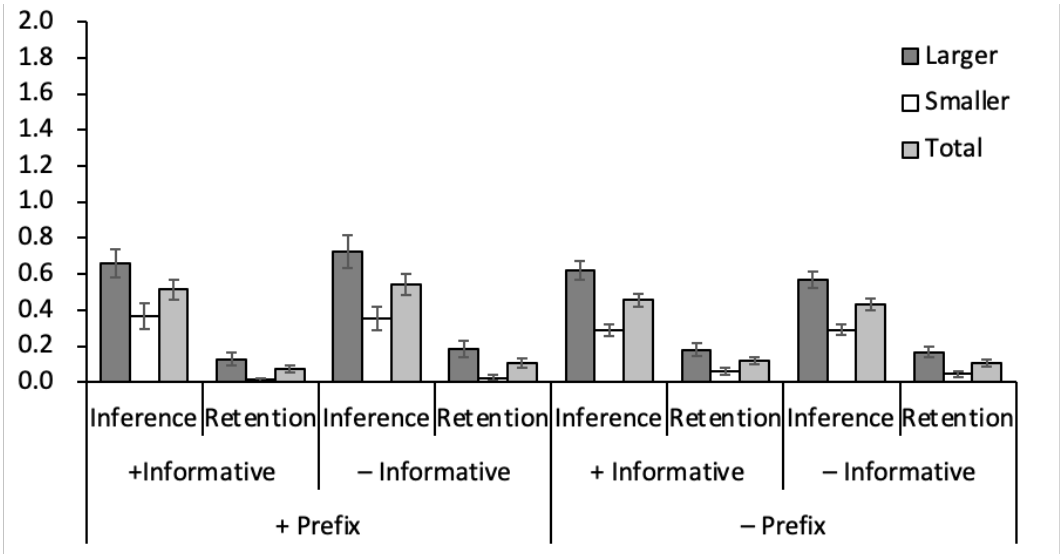


Figure 5.8. The scores of the lexical-inferencing task (Inference) and the learning-confirmation test (Retention) in Experiment 5 by vocabulary-size groups (Larger: n = 40; Smaller: n = 39; Total: N = 79). +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition. The maximum possible score was 2.00. (± standard errors)

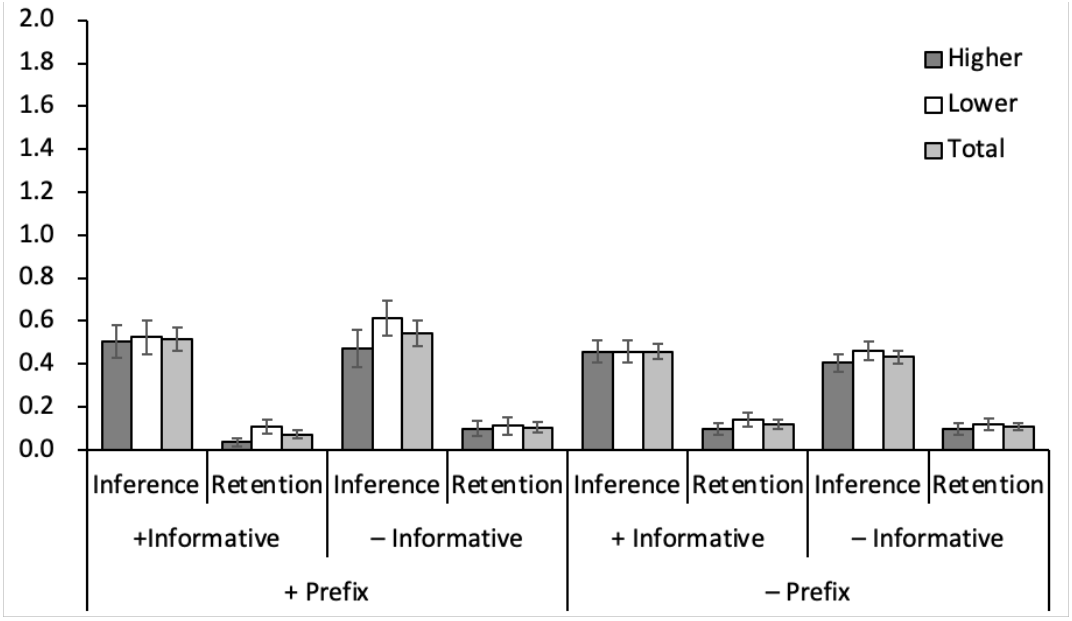


Figure 5.9. The scores of the lexical-inferencing task (Inference) and the learning-confirmation test (Retention) in Experiment 5 by reading-proficiency groups (Higher: n = 40; Lower: n = 39; Total: N = 79). +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition. The maximum possible score was 2.00. (± standard errors)

5.2.3.2 Intervention, Clues Available in Text, and Learner Proficiency in Vocabulary Learning Through Lexical Inferencing

Vocabulary-size and reading-proficiency tests. Table 5.9 summarizes the results of the vocabulary-size test in light of the lookup condition. The results of the *t*-test revealed that participants' vocabulary size performance differed significantly depending on whether they looked up target word meanings after inferencing, $t(77) = 3.30$, $p = .001$, $d = 0.78$. This indicates that participants who were given the meaning of the target words after the inferencing task had a smaller vocabulary size than those who were not provided with the target word meanings. This result means that the difference between the lookup and non-lookup conditions in the scores on the task and test can be affected by the difference between the two vocabulary size groups.

Table 5.9

Descriptive Statistics of the Vocabulary-Size Test According to the Intervention Condition in Experiment 5

Intervention	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Lookup	27	2742.22	[2436.62, 3047.83]	772.54	1577	4462
Non-Lookup	52	3422.38	[3167.55, 3677.22]	915.34	1154	5038
Total	79	3189.92	[2983.15, 3396.69]	923.13	1154	5038

Table 5.10 summarizes the results of the reading-proficiency test in light of the lookup condition. The results of the *t*-test confirmed that participants' reading proficiency performance was not significantly different in the versions of the lexical-inferencing task, $t(77) = 1.03$, $p = .304$, $d = 0.23$, ensuring that the difference in presenting the target word meaning after the inferencing task does not need to be considered when interpreting the

results shown in Table 5.10 for reading proficiency.

Table 5.10

Descriptive Statistics of the Reading-Proficiency Test According to the Intervention Condition in Experiment 5

Intervention	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Lookup	27	3.41	[2.55, 4.27]	2.17	0	0
Non-Lookup	52	3.35	[2.83, 3.86]	1.85	0	8
Total	79	3.37	[2.93, 3.80]	1.95	0	8

Note. The maximum possible score was 26.

Lexical-inferencing task and learning-confirmation test. Table 5.11 shows the descriptive statistics of the scores for the lexical-inferencing task and learning-confirmation test summarized in terms of the intervention, prefix availability, and contextual informativeness. Figure 5.10 visualizes these statistics.

As with vocabulary size and reading proficiency, I compared the means and 95% CIs of the two intervention conditions (lookup/non-lookup) of the scores for the lexical-inferencing task and learning-confirmation test. The results of the comparison revealed that the difference in the intervention did not have a significant effect on the overall scores across conditions and tasks. The mean of the lookup group (M = 0.24) was outside the 95% CI of the mean of the non-lookup one (95% CI = [0.27, 0.37]), but the mean of the non-lookup group (M = 0.32) was within the 95% CI of the lookup group (95% CI = [0.16, 0.32]), resulting in a small–middle effect size (d = 0.40). Note that although the mean of the non-lookup group was within the 95% CI of the mean of the lookup group, the former mean was almost outside the latter's 95% CI. In addition, the effect size is between small

and middle; thus, a marginally significant effect between them is presumed. In fact, there are three significant differences, namely in the scores of the – prefix + informative (the lookup: M = 0.30, 95% CI = [0.22, 0.38]; the non-lookup: M = 0.54, 95% CI = [0.45, 0.63]; d = 0.81) and – prefix – informative (the lookup: M = 0.32, 95% CI = [0.25, 0.40]; the non-lookup: M = 0.49, 95% CI = [0.41, 0.57]; d = 0.63) lexical-inferencing task, as well as scores of the + prefix + informative learning-confirmation test (the lookup: M = 0.03, 95% CI = [-0.01, 0.08]; the non-lookup: M = 0.09, 95% CI = [0.04, 0.14]; d = 1.06).

Table 5.11

Descriptive Statistics of the Lexical-Inferencing Task and the Learning-Confirmation Test in Experiment 5 (Intervention)

		Prefix-available condition								Prefix-unavailable condition							
		More informative condition				Less informative condition				More informative condition				Less informative condition			
		Inference		Retention		Inference		Retention		Inference		Retention		Inference		Retention	
Intervention	*n*	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI	*M* (*SD*)	95% CI
Lookup	27	0.43 (0.55)	[0.21, 0.65]	0.03 (0.12)	[-0.01, 0.08]	0.51 (0.57)	[0.28, 0.73]	0.14 (0.32)	[0.01, 0.26]	0.30 (0.21)	[0.22, 0.38]	0.12 (0.20)	[0.04, 0.19]	0.32 (0.20)	[0.25, 0.40]	0.10 (0.07)	[0.03, 0.17]
Non-Lookup	52	0.56 (0.45)	[0.43, 0.68]	0.09 (0.19)	[0.04, 0.14]	0.56 (0.51)	[0.42, 0.70]	0.09 (0.18)	[0.04, 0.14]	0.54 (0.33)	[0.45 0.63]	0.12 (0.19)	[0.07, 0.17]	0.49 (0.30)	[0.41, 0.57]	0.11 (0.15)	[0.07, 0.15]
Total	79	0.51 (0.49)	[0.41, 0.62]	0.07 (0.49)	[0.41, 0.62]	0.54 (0.17)	[0.03 0.03]	0.11 (0.53)	[0.42, 0.66]	0.46 (0.24)	[0.05, 0.16]	0.12 (0.32)	[0.39, 0.53]	0.43 (0.19)	[0.08, 0.16]	0.11 (0.28)	[0.37, 0.49]

Note. *Inference* refers to performance on the lexical-inferencing task, *Retention* indicates performance on the learning-confirmation test, the maximum possible score was 2.00.

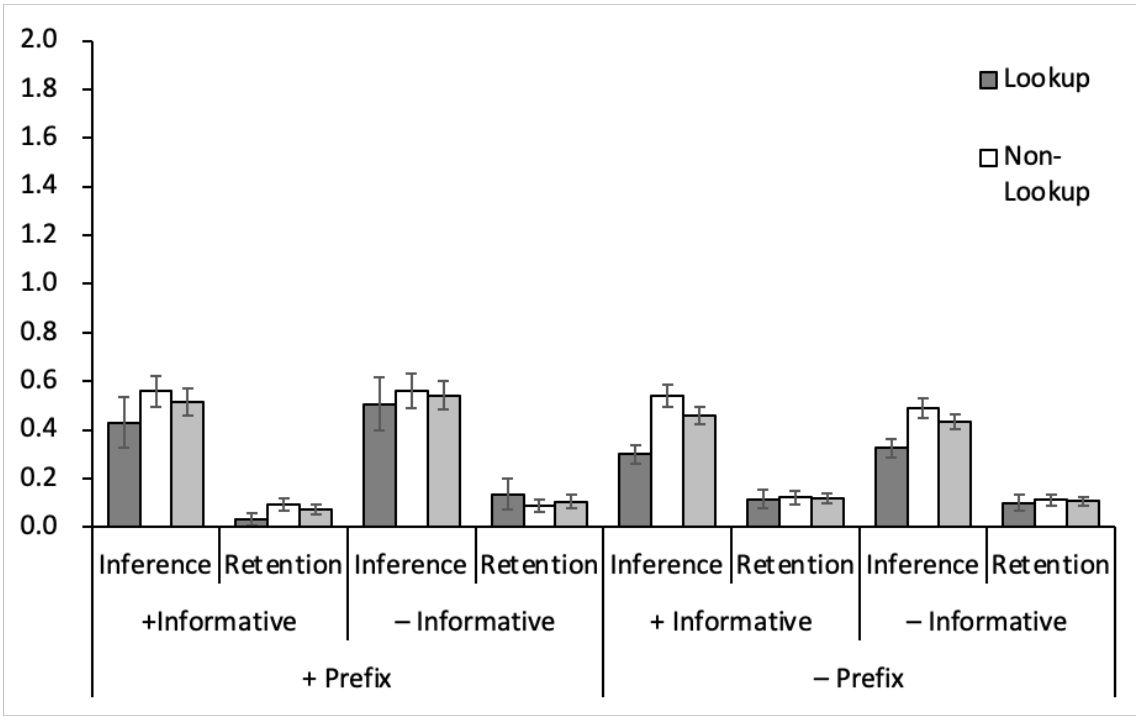


Figure 5.10. The scores of the lexical-inferencing task (Inference) and the learning-confirmation test (Retention) in Experiment 5 by lookup groups (Lookup: n = 27; Non-Lookup: n = 52; Total: N = 79). +/– Prefix = Prefix Available/Unavailable Condition, +/– Informative = More/Less Informative Context Condition. The maximum possible score was 2.00. (± standard errors)

5.2.4 Discussion

5.2.4.1 Effect of Morphological and Contextual Clues and Learner Proficiency on Lexical Inferencing (RQ 5-1, RQ 5-3)

Morphological and contextual clues. The results of the ANOVA showed a simple effect of prefix availability on the scores for the lexical-inferencing task, which partially followed up the results in Experiment 4. Together, both experiments ensured that prefix information is effective for EFL learners to infer word meaning as long as it is known to them. However, an interaction between prefix and contextual information was not found in the scores for the lexical-inferencing task, which was indicated in the results of Experiment 4. Therefore, this experiment did not replicate Experiment 4 in terms of

contextual informativeness.

Vocabulary size. Comparing the means of the lexical-inferencing task in terms of vocabulary size revealed consistent better performance by participants with a larger vocabulary size than those with a smaller vocabulary size under all four conditions. As mentioned, the ANOVA did not produce an interaction of prefix and contextual clues.

However, a comparison of the effect sizes of the differences between the two vocabulary size groups in the lexical-inferencing task revealed the effect of contextual informativeness indirectly. Specifically, the magnitude relation of the effect sizes is as follows: − prefix + informative (d = 1.22) > – Prefix – Informative conditions (d = 1.16) > + prefix – informative (d = 0.74) > + prefix + informative (d = 0.62). This relation is visually illustrated by the differences in the bars in Figure 5.8. This relation of the effect sizes demonstrates that the difference by vocabulary size increased most under the − prefix + informative condition. This substantiates the reasoning developed in Experiment 4: Learners with a large vocabulary size use contextual and prefix clues to infer word meaning, while those with a small vocabulary size cannot use either clues, resulting in the large difference indicated.

In addition, the difference in the effect size between the + prefix – informative and + prefix + informative conditions (d = 0.74 vs. d = 0.62: Difference = 0.12) is smaller than the differences between the − prefix + informative and + prefix – informative condition (d = 1.22 vs. d = 0.74: Difference = 0.48) and− prefix + informative and + prefix – informative conditions (d = 1.22 vs. d = 0.62: Difference = 0.60). As discussed for Experiment 4, prefix information is a substantially available resource for EFL learners regardless of vocabulary size as long as the clues are known to them. Thus, the difference between the two vocabulary size groups diminished in the two prefix-availability conditions.

The large difference by vocabulary size under the − prefix − informative condition (d = 1.22) is aligned with Experiment 4. I explained this difference in Experiment 4 as follows: Learners with a large vocabulary size may use different inferential strategies such as using clues other than prefix and contextual information (e.g., background knowledge), leading to successful inferencing. However, this possibility cannot be investigated by analyzing the results from paper-and-pencil tests, but should be compared with the results of past studies dealing with the online method such as the think-aloud method. (A comparison with the think-aloud data from Experiment 2 is dealt with in the General Discussion in Chapter 6).

Reading Proficiency. The mean comparison of the lexical-inferencing task demonstrated no significant difference between the two reading proficiency groups under all four conditions. This result can be attributed to two reasons. First, the reliability of the reading-proficiency test was low (Cronbach's α = .41), as was the one in Experiment 4 (Cronbach's α = .39). Therefore, the reading test could not sufficiently measure participants' reading proficiency. These facts together indicate the impropriety of the reading-proficiency test used in Experiments 4 and 5 to measure the reading proficiency of the university students who participated in these experiments.

The comparison also showed no difference by reading proficiency in the scores for the – prefix – informative lexical-inferencing task, unlike in Experiment 4. This result and the low reliability of the reading-proficiency test suggest that the difference between the two reading proficiency groups in the scores for the – prefix – informative lexical-inferencing task was unreliable.

Summary. Although the effect of prefix availability on lexical inferencing was revealed, the results of the ANOVA did not partially replicate those of Experiment 4 directly (Answer to RQ 5-1). However, the comparison of the means and effect sizes

suggests the effect of vocabulary size on the use of the informative context, which was discussed in Experiment 4 (Answer to RQ 5-3). Thus, the results of Experiment 5 indirectly supported the explanation for the relationship between in-text clues, learner proficiency, and lexical inferencing developed in the previous experiment.

5.2.4.2 Effect of Morphological and Contextual Clues and Learner Proficiency on Retention of Inferred Word Meaning (RQ 5-2, RQ 5-3)

Overview of retention of inferred word meaning. The analysis of the scores for the lexical-inferencing task and learning-confirmation test also showed the simple main effects of task under the prefix-available and prefix-unavailable conditions. These indicate that not all target words were retained in a week, which is aligned with Experiment 4. However, the performance of retention was worse than in the previous experiment. Experiment 4 demonstrated that approximately one third or half the target words inferred were retained after a week, whereas in this experiment, nearly a quarter of the target words inferred were retained after a week according to the descriptive statistics (see Tables 5.7, 5.8, and 5.11, and Figures 5.8–5.10). Webb (2008) reported that inferring word meaning resulted in retaining approximately 13% of the new words. In contrast, participants recalled less than 10% (below 2 items) of the meanings of the 22 target words.

The difference in the results for retention between the present and previous experiments is caused by the form of the recall test. In the learning-confirmation test created in Experiment 5, the target word in the experimental passage was replaced with parentheses. Therefore, participants had to recall the meanings of the target words based on the context sentences.

Morphological and contextual clues. An interaction between prefix availability and contextual informativeness was not found in the scores for the learning-confirmation

test, unlike in Experiment 4. Moreover, a main effect of contextual informativeness was also not identified. That is, the effect of contextual informativeness was not evident for the recall performance of inferred word meaning (Answer to RQ 5-1).

This lack of an effect of contextual informativeness on retention ensures the reliability of the instructions during treatment. In the learning-confirmation test used in this experiment, the word form of the target word in the experimental passage was not presented to participants. Instead, it was replaced with parentheses. This was to exclude the possibility that participants did not recall the inferred word meaning, but instantaneously inferred the meaning while working on the learning confirmation task. Based on this, it is assumed that if the participants had answered the items by inferring word meaning at that moment rather than by recalling the inferred word meaning, the scores of the learning-confirmation test would have been higher under the more informative condition than in the less informative one. However, the ANOVA did not provide such as result, indicating that the scores for the learning-confirmation test reflect participants' retention of inferred word meaning, not their instant inference when completing the learning-confirmation test. Thus, it is reasonable to think that instructing participants to leave the item unanswered if they could not recall the word's meaning worked well. Furthermore, the reliability of the results of the learning-confirmation test in Experiment 4 also increased, because the same instruction was given to the participants in Experiment 4, where its effectiveness was confirmed.

Vocabulary size. Regarding the results of the lexical-inferencing task, a comparison of the mean scores of the learning-confirmation test according to vocabulary size showed a consistent significant difference under all four conditions, meaning that the participants with a larger vocabulary size outperformed their counterparts regardless of the availability of in-text clues. This corresponds with the case of the lexical inferencing

discussed in the previous section.

This better retention performance by participants with a larger vocabulary size can be explained as follows. Vocabulary learning through lexical inferencing cannot take place unless L2 learners succeed in inferring word meaning, as Laufer (2003) argues. In other words, the large number of inferred words retained by learners' results from the high successfulness of their informed guesses regarding word meaning. Therefore, participants with a larger vocabulary size, who were better at making successful inferences, tended to retain more words than those with a smaller vocabulary size.

Reading Proficiency. Unlike vocabulary size, the difference between the two reading proficiency groups was not evident in the scores for the learning-confirmation test across all conditions of the in-text clues. This result is consistent with that for Experiment 4. The lack of difference in terms of reading proficiency may be attributed to the low reliability of the reading-proficiency test, as noted in the previous section. That is, participants' reading proficiency measured in this experiment does not reflect their potential reading ability as well as in Experiment 4. Thus, the result did not show any difference between the two reading proficiency groups.

Summary. The results of the learning-confirmation test confirmed the fundamental fact of incidental vocabulary learning, namely that the efficacy of learning vocabulary through lexical inferencing is naturally not very high, but inferred word meaning can be retained to some extent. Furthermore, the results of the experiment extended the findings of previous research on vocabulary learning through lexical inferencing as follows. First, for contextual information, recalling inferred word meaning based on contextual information is demanding for EFL learners, and contextual informativeness during lexical inferencing was not reflected in the retention of inferred word meaning (Answer to RQ 5-2). Second, successful inference is essential for incidental vocabulary learning, and the

breadth of L2 vocabulary knowledge can help L2 learners gain vocabulary through lexical inferencing (Answer to RQ 5-3).

5.2.4.3 Effect of Looking Up Word Meaning on Vocabulary Learning Through Lexical Inferencing Using Morphological and Contextual Information (RQ 5-4)

The *t* test for estimated vocabulary size between the two intervention groups (i.e., lookup vs. non-lookup conditions) produced a significant difference. Specifically, the vocabulary size of participants in the lookup group was significantly smaller than that of those in the non-lookup group, and this difference was large (d = 0.78). This result indicates the risk that even if there is a difference between these two groups, it is actually caused by vocabulary size, not the intervention itself. This is sufficient to judge that discussing the difference by the two intervention groups would not lead to the investigation of the effect of looking up word meaning after inferencing on subsequent vocabulary learning. Thus, although the three significant middle–large effect-size differences were found in the scores for the – prefix + informative, – prefix – informative lexical-inferencing task, and in the scores of the + prefix + informative learning-confirmation test, I do not discuss these results because of the reason provided above (Answer to RQ 5-4).

5.2.5 Summary of Experiment 5

Experiment 5 aimed to replicate Experiment 4 to obtain a more precise picture of interactions among in-text clues and learner proficiency on vocabulary learning through lexical inferencing among Japanese EFL university students. The focus was on morphology and contextual informativeness. In addition to the replication, this experiment also attempted to reveal the effect of looking up word meaning after

inferencing on subsequent vocabulary learning. As a result, this experiment partially replicated the results of Experiment 4 as follows. First, EFL learners inferred word meaning better when unknown words contained prefixes they knew irrespective of contextual informativeness (Answer to RQ 5-1). Second, EFL learners' performance on the retention of inferred word meaning was lower than that in Experiment 4 and not influenced by morphological or contextual clues (Answer to RQ 5-2). In addition, the examination of these results in terms of learner proficiency supported the discussion in Experiment 4. EFL learners with a large vocabulary can use morphological information efficiently and switch clue types from morphological to contextual, leading to better inference and retention performance (Answer to RQ 5-3). However, this experiment unfortunately failed to reveal the effect of looking up word meaning after inferencing on subsequent word learning because of a methodological problem (Answer to RQ 5-4).

5.3 Conclusion of Study 2

The purpose of Study 2 was to investigate the relationships between prefix availability, contextual informativeness, and learner proficiency in vocabulary learning through lexical inferencing by EFL learners. To address this purpose, I conducted Experiments 4 and 5.

Experiment 4 explored how vocabulary learning through lexical inferencing among Japanese EFL university students was affected by clues available in the text and learner proficiency using a paper-and-pencil lexical-inferencing task and learning-confirmation test. The findings of this experiment can be summarized as follows: (a) EFL learners demonstrated better performance for lexical inferencing when unknown words contained prefixes they knew and the surrounding context was informative for word meaning inferencing. (b) They demonstrated better retention of inferred word meaning a week after

inferencing when unknown words had prefixes they knew and the context was not informative in terms of inferring word meaning. (c) The role of English vocabulary size in using morphological information efficiently and switching clue types from morphological to contextual in EFL lexical inferencing led to better retention performance.

Experiment 5 aimed to replicate Experiment 4 and reveal the effect of looking up word meaning after inferencing on subsequent vocabulary learning. This experiment yielded the four following findings: (a) EFL learners demonstrated better lexical inferencing performance when unknown words contained prefixes they knew irrespective of the informativeness of the surrounding context. (b) They demonstrated lower performance for the retention of inferred word meaning than in Experiment 4. (c) The non-existence of an interaction between prefix and contextual information on retention was found. (d) The importance of vocabulary size for using morphological information efficiently and switching clue types from morphological to contextual in EFL lexical inferencing, which leads to better retention performance, was confirmed.

The findings of the two experiments show that first, regarding learning efficacy, learning EFL vocabulary through lexical inferencing is not expected to yield a high return. However, its outcome can fluctuate depending on factors such as clues EFL learners use during inferencing or the degree to which they find inferencing demanding. Second, success in lexical inferencing necessarily leads to learning inferred word meaning, but learning vocabulary from the text requires EFL learners to achieve successful inferencing. Last, L2 vocabulary size is key to good inference and retention performance. Specifically, EFL learners with a large English vocabulary size possibly use in-word clues (i.e., prefixes) efficiently and switch clue types from prefix to contextual to achieve successful inference, resulting in good performance in terms of vocabulary learning.

Chapter 6

General Discussion

6.1 Overview of Findings

This chapter provides a general discussion of vocabulary learning through lexical inferencing using morphological and contextual information among EFL learners, based on the results of Studies 1 and 2. Both studies showed informative results on L2 lexical inferencing and incidental vocabulary learning. Study 1 explored the effects of prefix availability, contextual informativeness, and learner proficiency on lexical inferencing among Japanese EFL university students (Experiments 1–3), and Study 2 examined how such in-text clues and learner proficiency affect vocabulary learning through lexical inferencing among EFL university students (Experiments 4 and 5).

Prior to the general discussion, I briefly summarize the findings of the five experiments. The first experiment was carried out to explore the effects of prefix information in target words and L2 vocabulary size on Japanese EFL lexical inferencing. The participants in this study inferred the meanings of 22 target words with prefixes that were either known or unknown to them (prefix availability). All target words were presented in sentences that were insufficiently informative to allow inferencing of the word meaning. The result showed that the availability of prefixes in unknown words contributed to EFL learners' success in inferring word meanings, and L2 vocabulary size had an influence on successful lexical inferencing. However, an interaction between these two factors was not found from the result. In addition, this experiment was implemented using a paper-and-pencil form lexical-inferencing task; thus it was not clear what kind of clues and inferential strategies the learners actually used during lexical-inferencing process.

Therefore, Experiment 2 was carried out. using a think aloud method. In this experiment, the participants engaged in a lexical-inferencing task consisting of four conditions, (prefix availability: +prefix/–prefix) × 2 (context: +informative/–informative), and an L2 reading-proficiency test. During this think-aloud study, the participants reported aloud what they were thinking as they inferred a word's meaning. The findings of Experiment 2 were as follows: First, prefix availability had a strong effect on successful lexical inferences. Second, when an L2 learner encountered an unknown prefix in an unknown word, the learner tended to repeat the phrase, trying to determine its meaning using prior knowledge or construct a phrase in which the word's meaning might be easier to infer. However, an interaction between the two in-text clues and learners' reading proficiency could not be examined because of statistical limitations.

Experiment 3 aimed to explore the relationship between the use of morphological and contextual clues and learner factors, and the difficulty EFL learners face in lexical inferencing, focusing on their L2 vocabulary size and reading proficiency. The result of the paper-based multiple-choice lexical-inferencing task revealed the following: (a) EFL learners infer a word's meaning by combining clues such as information from the prefix within the target word and the context of the sentence, and this process can be observed with a paper-based multiple-choice lexical-inferencing task, (b) performance of L2 vocabulary-size test predicts the selection of choices in the inferencing task to some extent, and (c) EFL learners with low L2 proficiency tend to depend on morphological clues because the use of contextual information requires a certain degree of L2 proficiency.

Experiment 4 investigated the interactive effects of the two in-text clues and the two kinds of L2 proficiency on EFL vocabulary learning through lexical inferencing. In these experiments, participants inferred the meanings of 22 target words containing both known and unknown prefixes in sentences with varying levels of informative context.

After one week, participants were asked to recall the inferred meanings. The result showed a better performance by EFL learners on lexical inferencing when unknown words contained prefixes they knew and the surrounding context was informative for word meaning inferencing, and better retention of inferred word meaning a week after inferencing when unknown words had prefixes learners knew and the context was not informative enough to infer word meaning. A further examination of these performances suggests the roles of English vocabulary size in using morphological information efficiently and of switching clue types from morphological to contextual in EFL lexical inferencing, leading to better retention performance.

Experiment 5 was conducted in the same way as the first except for two differences: a recall task and procedure. These two differences were made in order to measure participants' recall of inferred word meaning more precisely, and to explore an instructive intervention of making the retention more efficient: looking up word meaning after inferencing. The result revealed better lexical-inferencing performances by EFL learners when unknown words contained prefixes they knew, irrespective of the informativeness of surrounding context. There was poorer performance on retention of inferred word meaning than in Experiment 4 due to the difficulty in recall based on contextual information, and the absence of an interaction between prefix and contextual information on retention. These did not replicate the results of Experiment 4, but the result was more precise as learner proficiency was found to support one of the findings on Experiment 4: the importance of vocabulary size for using morphological information efficiently, and the flexible use of clues from morphological to contextual both in EFL lexical inferencing and retention performance. However, this experiment failed to reveal the effect on the subsequent retention performance of looking up the word meaning after inferencing for methodological reasons.

Based on the results of these five experimental studies above, I will discuss the following points in this chapter: (a) the effects of prefix availability, contextual informativeness, and learner proficiency on lexical-inferencing process; and (b) the differences in the results of Experiments 4 and 5 regarding vocabulary learning through lexical inferencing.

6.2 EFL Lexical Inferencing Using Morphological and Contextual Information

Successful L2 vocabulary learning from reading requires learners to make precise inferences of a word's meaning. The process of making an inference of a word's meaning, or lexical inferencing, is defined as "making informed guesses as to the meaning of a word in light of all available linguistic cues in combination with the learner's general knowledge of the world and her awareness of the co-text and her relevant linguistic knowledge" (Haastrup, 1991, p. 40). One of the purposes of this study was to reveal the interaction between the use of these clues and learner proficiency in EFL lexical inferencing, focusing on the information of a prefix in an unknown word and the surrounding textual context. This section addresses this issue by discussing the results of the five experiments.

6.2.1 Roles of Prefix and Contextual Clues in EFL Lexical Inferencing

6.2.1.1 Effect of Prefix Clues on Lexical Inferencing

Previous studies examining the contribution of morphological clues toward successful lexical inferencing can be divided into the following positions: (a) Morphological clues contribute to success in lexical inferencing (e.g., Zhang & Koda, 2012), and (b) morphological clues are not useful in inferring the meaning of unknown words (e.g., Nakagawa, 2006).

The results of the experiments in this study generally revealed a positive effect of prefix information on lexical inferencing. This effect was shown by the significant differences in the ANOVA in Experiment 1 and the Wilcoxon signed-rank test in Experiment 2. Moreover, the analysis of the verbal protocols obtained through the think-aloud method, focusing on the differences in prefix availability in Experiment 2, showed that a lack of prefix availability in an unknown word prompted L2 learners to use different strategies such as repeating, using prior knowledge, and paraphrasing. Taken together, these results indicate the important roles of prefix information in the lexical inferencing of a novel L2 word and of EFL learners' sensitivity to the availability of in-word clues, even at the level of bound morphemes.

It should, however, be noted that the results above are reliable only when the following conditions are fulfilled: First, learners know the meanings of both the prefix and the base of a target unknown word. As described in the Norming Study 1 in Experiment 1, the target words consistently used through all five experiments were selected so that their bases were known to all groups of participants (i.e., EFL undergraduate and graduate students), so as to ensure that the differences in the availability of in-word clues are only due to the target words' prefixes (i.e., whether participants knew the prefixes or not). Second, learners know the meaning of a prefix that corresponds to that of a target word. Some English prefixes are polysemous; for example, the prefix *ex-* means both "out" and "former." Therefore even though a participant knew some meaning of a prefix in a target word, I judged their response to the prefix test as "unknown" when at variance with the meaning of a prefix in a target word. For this reason, it was possible that a participant actually knew one meaning of a prefix in a target word, but that the word was classified in the prefix-unavailable condition for the participant.

Last, the meaning of a prefix in a target word is linked to the whole meaning of the

target word the learners infer. The meaning of a morpheme in a word usually has a semantic relation to the word itself; for instance, the prefix *un-* expresses a negative sense, so the word *unhappy* denotes the state of not being happy. However, there are some exceptions to this relation; the word *uncanny*, for example, does not mean the opposite state of being canny, although these two words used to be antonyms. The results from the five experiments in this study are only applicable to the latter case.

To return to the subject, the results of this study showed the positive effect of an in-word prefix on lexical inferencing in cases where its meaning is known to learners. This is aligned with past research that explored the use of morphological clues during inferencing. For instance, Nassaji (2003) examined the knowledge source and strategies used in ESL lexical inferencing, revealing that morphological information was the second most used source, accounting for approximately one-quarter of the whole knowledge source. It is true that using many morphological clues does not necessarily signify the necessity of the use of morphological information for successful lexical inferencing, and indeed, the study by Nakagawa (2006) showed that morphological clues were useful for identifying the parts of speech of unknown words but contributed to lexical inferencing relatively less than contextual ones.

Besides this, finding, the present study's results also indicated that among kinds of morphemes, an in-word prefix, one of the smallest units called bound morphemes, can contribute to successful lexical inferencing. This is shown by the result of Experiment 2: The increased use of certain strategies in the prefix-unavailable condition compared to in the prefix-available one was found, which reflects participants' sensitivity to the availability of morphological clues in an unknown word, even at the level of bound morpheme.

English words, in particular academic vocabulary, tend to make derivational forms

by adding affixes (Goodwin et al., 2017). Indeed, children whose L1 is English have been found to learn approximately 60% of novel words that they encounter in text by analyzing words into morphemes (Nagy & Anderson, 1984). Taken together, both the importance of affixes for incidental vocabulary learning and the finding on the effect of prefix availability on lexical inferencing discussed above suggest that inferring and learning word meaning by using affixes is important not only for L1 speakers but also L2 learners.

However, previous studies that have investigated the relationship between morphological clues and success of L2 lexical inferencing did not focused on affix use. For example, Hamada (2014) examined the use of morphological and contextual clues in ESL lexical inferencing using compounds that consisted of a free morpheme and a pseudo word. Other studies analyzed learners' use of morphemes including affixes, but they did not confirm that the learners had already known the meanings of the affixes through any norming study (Nakagawa, 2006; Nassaji, 2003). Thus, whether an affix in an unknown word would contribute to successful lexical inferencing needed exploring. The present study provided an insightful finding regarding this problem: that is, EFL learners can make use of a prefix in an unknown word to infer word meaning.

To sum up, there are mainly two findings regarding the effect of morphological clues: First, EFL learners succeed in inferring word meaning by making use of a morpheme, especially a prefix in an unknown word when it is available, or already known to the learners. Second, the increased use of certain strategies in the prefix-unavailable condition might have reflected participants' sensitivity to the availability of morphological clues. The findings of the present study have taken the discoveries of past studies on EFL learners' morphology-based lexical inferencing and incidental vocabulary learning one step further.

6.2.1.2 Effect of Contextual Informativeness on Lexical Inferencing

Another important source of L2 lexical inferencing is information from the context of an unknown word. Previous L2 research on the relationship between contextual information and lexical inferencing has shown that context quality affects lexical inferencing (e.g., Hamada, 2011; Webb, 2008). As with morphological clues, however, contextual information is also not always helpful, as argued by Beck et al. (1983).

The results of this study did not show any effect of contextual informativeness on EFL lexical inferencing. Specifically, no significant difference by contextual informativeness was found in the results yielded by the Wilcoxon signed-rank test in Experiment 2 and the ANOVA in Experiment 5. This indicates that the contextual informativeness controlled in this study did not affect lexical inferencing uniquely. This is not consistent with previous studies showing a positive effect of contextual information on success of inference (Brusnighan & Folk, 2012; Haastrup, 1991; Hamada, 2013; Nakagawa, 2006). There are two main possibilities accounting for this result.

First, the extent of contextual informativeness in the second experiment was not high enough to show a significant difference, which is explainable by findings from previous studies. For example, Ushiro et al. (2013) compared contextual clues with discourse-level clues in Japanese EFL lexical inferencing, revealing that learners changed contextual clues that did not function in discourse-based lexical inferencing into effective ones by connecting the contextual clues with available discourse information. This finding suggests that a contextual clue itself is not effective for lexical inferencing unless it connects with other available clues such as discourse information. Thus, more detailed research investigating the relationship between contextual clues and other information is required in the future.

Second, the result from Experiment 2 may be attributed to the difference in

methodological processes between the two experiments. Unlike the norming study conducted as part of processes in Experiment 1, where 10 university students with various specialties rated the extent of the experimental passages' contextual informativeness, two graduate students engaged in the same rating procedure. This allows one to assume that the contextual informativeness rated through Norming Study 2 in Experiment 1 was more valid than the counterpart rated in Experiment 2 in terms of homogeneity between the raters and the participants in the main experiment.

Note that contextual information itself is not a useless resource for lexical inferencing. The analyses of verbal protocols conducted in Experiment 2 revealed that a lack of prefix availability in an unknown word prompted L2 learners to use different strategies such as repeating, using prior knowledge, and paraphrasing. Among the three strategies, only a paraphrasing strategy was found to be effective for lexical inferencing. Using a paraphrasing strategy denotes that a learner focuses on the meaning of a phrase or text that contains a target unknown word (Hu & Nassaji, 2014). These facts indicate that the participants in Experiment 2 actually used contextual information, and that their use of contextual clues might have led to successful inferencing irrespective of contextual informativeness.

To sum up, the results pertaining to contextual informativeness revealed the two following facts: There was no difference made by contextual informativeness on inference performance; and the fact that contextual information itself is a good resource for inferencing as well as a known prefix in an unknown word, irrespective of the contextual informativeness conditioned by me.

6.2.1.3 Interaction between Prefix and Contextual Clues on Lexical Inferencing

The results of Experiment 4 demonstrated an interaction between prefix availability

and contextual informativeness in EFL lexical inferencing. To be more specific, prefix availability had a positive effect on the score for the lexical-inferencing task for word meaning when the context sentence was comparatively more informative. In addition, a lesser extent of prefix availability in positively affecting inference performance was seen when the context sentence was less informative. This interaction was not replicated in Experiment 5. Instead, this experiment showed a positive effect of prefix availability on lexical inferencing. What these results suggest is that the use of unknown words with prefixes known to learners would be affected by the informativeness of the surrounding context during inferencing, but this interaction is not stable.

This result aligns with the result from Hamada's (2014) high-proficiency ESL learners. This study reported that learners who had higher level of proficiency in English switched clue types from morphological to contextual, leading to better inference performance. This result can be explained by the notion of strategic morphological analysis (Goodwin et al., 2017), whereby the strategic use of morphemes can take place in case a reader can analyze in-word structure, the meanings of affixes in the words, and the contextual information. Thus, learners might have been set up with such a condition thanks to the availability of both the prefix and contextual clues.

To sum up, the results of the five studies are as follows: EFL learners are sensitive to in-text clues, even at the level of bound morphemes. Thus prefix information on a word is effective in their lexical-inferencing performance if they know the prefix. In addition, this effect of prefix availability could be affected if the context sentence is informative for word meaning. However, the discussion so far lacks a view of learners' proficiency. As reported by Hamada (2014), the interactive effect of morphological and contextual clues on lexical inferencing was distinctive to high-proficiency learners. Thus, the next section will focus on the relationship between the use of prefix and contextual information,

and L2 vocabulary size and reading proficiency.

6.2.2 Effect of L2 Proficiency on Lexical Inferencing Using Morphological and Contextual Information

6.2.2.1 Effect of L2 Vocabulary Size on Lexical Inferencing

In the end of the previous section, the possibility of effects of learners' proficiency on lexical inferencing using morphological and contextual information, as reported by previous studies (e.g., Hamada, 2014; Nakagawa, 2006), was indicated.

The result of this study revealed the consistent effects of L2 vocabulary size on lexical inferencing using the two in-text clues (i.e., morphological and contextual clues). To be more specific, the main effect of vocabulary size was shown by the results of the ANOVA in Experiment 1. Experiment 3 revealed that the performance of L2 vocabulary-size test predicts the selectivity of choices in the inferencing task to some extent. EFL learners with lower L2 proficiency tend to depend on morphological clues, because the use of contextual information requires a certain degree of L2 proficiency. The mean comparison in Experiments 4 suggests that L2 vocabulary size contributes to lexical inferencing using prefix knowledge, irrespective of contextual informativeness. Also, L2 learners with larger vocabulary sizes can make use of contextual clues to infer word meaning, but learners with smaller vocabulary sizes were found unable to do so. The result of Experiment 5 is thus supported by the interpretation of Result 4 above.

These consistent, better performances attained by EFL learners with larger vocabulary sizes than with smaller ones was probably due to their higher morphological awareness. Morphological awareness is the ability to reflect on and manipulate morphological clues. This ability has been found to contribute indirectly to the growth of vocabulary knowledge. Also, the relationship between EFL learners' vocabulary size and

their knowledge of English morphemes has been reported to be correlative (Mochizuki & Aizawa, 2000). Thus, having a larger vocabulary size can be regarded as having better morphological awareness.

However, among these results related to vocabulary size, the result of Experiment 1 did not show an interactive effect between vocabulary size and in-text clues, but the main effect of vocabulary size was observed on lexical-inferencing performance. It is shown by the model examined by Zhang and Koda (2012) that Chinese EFL learners' morphological awareness contributes to their L2 vocabulary knowledge through their lexical-inferencing ability. In addition, morphological awareness and increases in vocabulary knowledge are not supposed to be a one-way progress but a cyclical relation, based on the notions of the LQH (Perfetti & Hart, 2002) and the elaborated one (Nation, 2013). Taking these into consideration, the lack of an interaction between vocabulary size and prefix availability contradicts findings from past research.

One possible explanation for this is that the use of prefixes has no relation with the learners' vocabulary use. It is true that not only learners with a large vocabulary size, but also learners with smaller vocabulary sizes can employ morphology to infer word meaning using reliable in-word clues to some extent, as shown by the results of Hamada's study (2014). However, the comparison of means in Experiment 4 showed that participants with larger vocabulary size outperformed those in the smaller vocabulary-size group in lexical inferencing using available prefix information. The results of Experiment 5 also confirm this. These results of Experiments 4 and 5 mean that the more English vocabulary an EFL learner gains, the easier it is for them to make an informed guess on a word's meaning if the word's prefix is known to them. Thus, this explanation should be rejected.

There seems to be a contradiction between the two findings from this study so far:

An interaction between vocabulary size and prefix availability was not found by Experiment 1; EFL learners with larger vocabulary sizes performed better than those with smaller vocabulary size during lexical inferencing using available prefix information in Experiments 4 and 5.

To resolve this apparent inconsistency, I compared the vocabulary size of the participants in each experiment. Table 6.1 summarizes the estimated vocabulary size of the participants in Experiments 1, 3, 4, and 5. I conducted a one-way ANOVA for vocabulary size including Experiment as a factor, finding significant differences among experiments, $F(3, 281) = 50.32$, $p < .001$, $\eta_p^2 = 0.35$. To compare these significant differences, a multiple comparison for Experiments in Holm's, a sequentially rejective Bonferroni procedure was conducted. The result revealed that the vocabulary size of the participants in Experiment 1 was significantly larger than that of the participants in the other experiments (ps < .001), and the participants in Experiments 3–5 did not differ in their vocabulary size (ps > .05). These differences among the experiments in vocabulary size allowed me to make the following assumption: Lexical inferencing using available prefix information by the participants in Experiments 3–5 was probably affected by their vocabulary size. This can be explained by the possibility that EFL learners with larger vocabulary size, who are assumed to have higher morphological awareness than their counterparts, can deconstruct the target words into morphemes and reflect on their whole meanings. Regarding the participants in Experiment 1, however, even those in the smaller vocabulary-size group had larger vocabularies than those who had participated in the other experiments. Therefore, it is reasonable to assume that the participants in this experiment had high enough morphological awareness to infer word meanings, resulting in no interaction between prefix availability and L2 vocabulary size.

Table 6.1

Summary of the Results of the Vocabulary-Size Tests in the Present Study

Experiment	Group	*n*	*M*	95% CI	*SD*	*Min*	*Max*
Experiment 1	Larger	18	5606.84	[5483.13, 5730.54]	248.75	5385	6346
	Smaller	17	4683.26	[4425.56, 4940.95]	501.21	3269	5269
	Total	35	5158.24	[4949.72, 5366.77]	607.04	3269	6346
Experiment 3	Total	108	3428.06	[3261.81, 3594.32]	871.57	1038	5308
Experiment 4	Larger	30	3916.77	[3760.10, 4073.44]	419.57	3385	4808
	Smaller	33	2606.12	[2408.09, 2804.15]	558.48	1269	3308
	Total	63	3230.24	[3022.76, 3437.72]	823.84	1269	4808
Experiment 5	Larger	40	3974.07	[3840.86, 4107.28]	416.51	3308	5038
	Smaller	39	2385.67	[2220.36, 2550.97]	509.04	1154	3154
	Total	79	3189.92	[2983.15, 3396.69]	923.13	1154	5038

Note. Larger and Smaller indicate groups of participants allotted based on the median of the result in each experiment; the reliability of the vocabulary-size test conducted in each experiment was as follows: Experiment 1: Cronbach's α = .93; Experiment 3: Cronbach's α = .94; Experiment 4: Cronbach's α = .97; Cronbach's α = .98.

Moreover, this assumption also allows me to assume that the amount of vocabulary size of the participants in the smaller vocabulary-size group in Experiment 1 (*M* = 4683.26; 95% CI [4425.56, 4940.95]) can be indicative of a stable lexical inferencing using available prefix (+base) information in an unknown word. Therefore, having a vocabulary knowledge of approximately 4,500 English word possibly enables EFL learners to make successful guesses of the meaning of an unknown word using knowledge of its prefix and base.

However, the main effect of vocabulary size on lexical inferencing in Experiment 1 was not explained by the above assumption. One possible explanation for this result is that when neither prefix nor contextual information was reliable for inferencing, learners with a larger vocabulary might have noticed the unreliability of the two in-text clues and made informed guesses on the target word by changing their inferential strategies or the clues they relied on to out-text resources. EFL learners' switching inferential strategies due to lack of prefix availability in an unknown word were actually observed as they used the think-aloud method in Experiment 2. One of the strategies whose frequency of use increased in the prefix-unavailable condition was using prior knowledge as revealed in Experiment 2. Although this was not shown to be effective in inference by the analysis, this result holds two possibilities. First, the participants in Experiment 2 were learners with such a large vocabulary-size that they were sensitive to prefix availability. The participants in Experiments 1 and 2 were also from the same university, suggesting approximately the same level of English proficiency among them. Second, such learners with possibly high L2 proficiency could make use of outside-text clues such as their background knowledge rather than in-text clues if there were no reliable in-text clues (e.g., morphology, textual context). This possibility explains the result of Experiments 4 and 5, where learners with larger vocabulary sizes performed better than the learners with smaller vocabulary sizes on the scores of the prefix-informative lexical-inferencing task. This possibility needs to be explored more in further research applying on-line methods (e.g., the think-aloud method) focusing on L2 vocabulary size.

6.2.2.2 Effect of L2 Reading Proficiency on Lexical Inferencing

As stated in Section 6.2.1.2, earlier studies examined the relationship between contextual clues and learner proficiency in lexical inferencing (e.g., Hamada, 2014;

Nakagawa, 2006). These studies agree that learners with high proficiency tend to achieve successful inference of word meaning.

The results of the present study, however, showed little evidence of such relation, except in Experiment 3. The result of the simple regression analysis showed a significant relation between reading proficiency and selectivity of Con choice, but this relation minimally fitted the data (R^2 = .05); that is, the score of the reading-proficiency test only predicts 5% of the selection of the context-available choice by EFL learners. This result is in line with that of Hamada (2014), who concluded that learners with higher proficiency flexibly changed the clues they relied on to contextual information, resulting in successful inferencing. In addition to this experiment, Experiment 4 showed better performance on lexical inferencing by EFL learners with higher reading proficiency than in those with the lower proficiencies when neither prefix nor contextual information was useful for inferencing. However, the results of Experiment 5 did not reflect such a superiority of higher reading proficiency learners.

These weak, unstable results are probably due to the low reliability of the reading-proficiency tests used in the experiments. Table 6.2 is a summary of the results and reliability (Cronbach's α) of the reading-proficiency tests conducted in the present study.

As shown in the table below, the reliability of these reading tests cannot be regarded as sufficient except for Experiment 2. The reliability coefficients of the tests administered in Experiments 4 and 5 are below .5, and thus their results should be considered errors of measurement (Takeuchi & Mizumoto, 2014). It would be dangerous to interpret any difference by reading-proficiency group in the results of Experiments 4 and 5.

Table 6.2

Summary of the Results and Reliability of the Reading-Proficiency Tests in the Present Study

Experiment	Group	*n*	*M*	95% CI	*SD*	*Min*	*Max*	Cronbach's α
Experiment 2	Higher	10	18.20	[16.05, 20.35]	3.01	15	23	.82
	Lower	10	10.60	[8.49, 12.71]	2.95	4	14	
	Total	20	14.40	[12.13, 16.67]	4.86	4	23	
Experiment 3	Total	108	4.57	[4.10 ,5.05]	2.49	0	13	.60
Experiment 4	Higher	28	9.75	[9.19, 10.32]	1.46	8	13	.39
	Lower	35	5.00	[4.39, 5.61]	1.78	2	7	
	Total	63	7.11	[6.38, 7.84]	2.89	2	13	
Experiment 5	Higher	40	4.90	[4.49, 5.31]	1.28	4	9	.41
	Lower	39	1.79	[1.45, 2.14]	1.06	0	3	
	Total	79	3.38	[2.93, 3.80]	1.95	0	9	

Note. Higher and Lower indicate groups of participants allotted based on the median of the result in each experiment; the maximum possible score of each reading-proficiency test was as follows: Experiments 2, 4, 5 = 26; Experiment 3 = 21.

Following a suggestion by Takeuchi and Mizumoto (2014), I will discuss the reason for this low reliability of the reading-proficiency tests. The reading-proficiency test consisted of items extracted from retired versions of the reading section of EIKEN tests, but this does not necessarily mean that the EIKEN tests had lower reliability. In fact, the reading-proficiency test composed of the past EIKEN tests yielded a sufficiently high reliability coefficient (Cronbach's α = .82). According to Takeuchi and Mizumoto (2014), the reliability coefficient will be low if a group of test takers does not differ in proficiency levels. Comparing the means of the reading tests presented in Table 6.2 allows us to

assume that the reason for the low reliability of the reading-proficiency tests in Experiments 3–5 was caused by a gap between the reading proficiency of the participants and the measuring range of the reading test, rather than the intrinsic reliability of the test. For this reason, the following analysis of the effect of reading proficiency will be applied on the result of Experiment 2.

A difference by reading-proficiency in lexical inferencing performance was not shown in the result of Experiment 2. As discussed in Section 4.2.4.1, this result is not in accordance with parts of past research (Brusnighan & Folk, 2012; Nakagawa, 2006), which reported the effect of reading proficiency on successful lexical inferencing. However, the result partially supports the findings of Hamada (2013), which argued that L2 learners were able to activate general meanings of target words regardless of their L2 reading proficiency. In addition, the result is not consistent with Hamada (2014), who reported better performance by ESL learners with higher L2 proficiency than that by ones with the lower when contextual information is reliable, and an in-word clue not.

Unlike vocabulary size, the difference between the two reading-proficiency groups yielded no effect on lexical inferencing, although research has revealed a correlation between the vocabulary knowledge and reading proficiency of L2 learners (Qian, 2002). Thus, this absence of a reading-proficiency effect can be attributed to reasons unique to text reading. There are two possible reasons: The first is that the experimental passages, unlike those used in previous studies (e.g., de Bot et al., 1997; Nassaji, 2003), were not long enough to be contextually informative. Another is that the experimental passages adopted in this experiment were adjusted for participants (i.e., university students) in light of word and grammar levels. Therefore, reading proficiency made little difference when the participants read the passages.

6.2.3 Summary of Factors in Lexical Inferencing

For lexical inferencing using prefix and contextual clues, the findings of the five experiments in this study may be summarized as follows: (a) EFL learners succeed in inferring word meaning by making use of morphemes, especially a prefix in an unknown word, when it is available or already known to the learners; (b) contextual informativeness does not solely affect inference performance, but contextual information itself is a good resource for inferencing as well as a known prefix in an unknown word; (c) the increased use of certain strategies in the prefix-unavailable condition suggests participants' sensitivity to the availability of morphological clues; (d) L2 vocabulary size contributes to lexical inferencing using prefix knowledge irrespective of contextual informativeness; and (e) L2 learners with larger vocabulary size may be able make use of contextual clues to infer word meaning, but learners with smaller vocabulary sizes are unable to do so.

6.3 EFL Vocabulary Learning Through Lexical Inferencing Using Morphological and Contextual Information

Previous studies have argued that guessing word meaning is a good resource for vocabulary learning (e.g., Grabe, 2009; Nation, 2013). The discussion in Section 6.2 revealed that the use of in-text clues and learners' vocabulary size are key to inferring word meaning. However, the types of clues that affect inference and new vocabulary acquisition still merit examination. To address this gap, I conducted Experiments 4 and 5 to explore how L2 vocabulary learning via lexical inferencing would be affected by clues available in the text. This section examines vocabulary learning subsequent to lexical inferencing by focusing on the results of Experiments 4 and 5.

6.3.1 Differences Between Experiments

The outcomes of Experiment 4 showed that prefix availability and contextual informativeness interacted. As described in Section 6.2, this is possibly because the clues that learners can make use of depend on their vocabulary size. More specifically, it is necessary for learners to have a certain amount of vocabulary knowledge to be able make use of contextual clues to infer word meaning. On the other hand, the results of Experiment 5 revealed a consistently better retention performance by learners with a larger vocabulary size than their counterparts, irrespective of conditions of in-text clues, which contradicts the results of Experiment 4. Also, no effect of prefix availability in the outcomes of Experiment 4 was found.

The only difference between these two experiments is in the form of the recall test. The learning-confirmation test used in the former presented the spellings of target words to participants, whereas the latter only showed the contextual clues that corresponded to those in the inferencing task instead. Thus, it is valid to judge that the difference in question was due to the type of clues presented in the learning-confirmation test—the spellings of target words and passages without word form.

As discussed in Section 5.2.4.2, the better performance on retention by participants with larger vocabulary sizes probably reflects the simple but fundamental fact that a large number of inferred words retained by learners results from high success in their informed guessing of word meanings (Laufer, 2003). Learners with larger vocabulary sizes performed lexical inferencing better than their counterparts consistently under all four conditions. Therefore, it is safe to conclude that learners with larger vocabulary sizes, who were better at making successful inferences, tended to retain more words than the learners with smaller vocabulary sizes.

To explain the lack of a main effect of prefix availability on retention in Experiment 5, one may consider the possibility that the outcomes of Experiment 4 were due to instant inference during the test, rather than a consequence of their effort to recall word meanings. However, this explanation can be rejected by inference from the findings of the ANOVA. As stated in Section 5.2.4.2, instructing the participants to leave the item unanswered if they could not recall the word's meaning worked well in Experiment 5, based on the evidence of a lack of a main effect of contextual informativeness. Thus, it is likely that the participants in Experiment 5 could not recall word meanings using contextual clues alone.

6.3.2 Difficulty in Recalling Inferred Word Meanings Based on Contextual Clues

The reason why a contextual sentence where a word's meaning is inferred does not help a learner to recall inferred word meaning, unlike word form, can be explained from the following two perspectives. Note that the explanations below assume the case of EFL learners with a large vocabulary size, because learners with a small vocabulary size are supposed to be unable to employ contextual information for lexical inferencing in the first place, as affirmed in Section 6.2.

The first explanation is from the view of Bolgar et al.'s (2008) instance-based framework of word learning. This framework holds that encountering a novel word surrounded by a context leaves a trace of the word and its context in the reader's memory. Some aspects of this trace will be reinforced as the word is encountered in multiple contexts, whereas others will be weakened. Based on this notion, it is presumed that memory about a word whose meaning is inferred is stored in the learner's memory with contextual information where the word is encountered. However, such a presumption was not supported by the outcomes of Experiment 5. In the procedure of this experiment, the

participants were given the opportunity to encounter unknown target words only once. This is probably why contextual information could not serve as a clue to recall word meanings, because encountering an unknown word in a context only once was insufficient for target words to be reinforced in learners' memory. This is supported by past research (Waring & Takaki, 2003) finding that repeated encounters with certain unfamiliar words in texts were key to learning vocabulary from reading.

Second, the TOPRA model proposed by Barcroft (2000, as cited in Barcroft, 2002) can also explain the reason for the ineffectiveness of a contextual clue in recalling an inferred word meaning. This model assumes that when the demand of processing is sufficiently high, semantic elaboration facilitates learning semantic properties of words and inhibits the learning of words' structural properties due to learners' limited processing capacities (and vice versa; see Section 2.3.3). In the case of the present study, the structural elaboration corresponds to breaking down a target word into its morphemes (i.e., a prefix and a base); the semantic elaboration parallels inferring a word meaning based on the surrounding context. The explanation, based on the notion of this model, goes as follows: Participants' processing resources are allotted to target words' forms and meanings during lexical inferencing. Surrounding contexts were only used to check the validity of hypotheses on word meanings that the participants posed during inferencing, which is assumed in Huckin and Bloch's (1993) model of lexical inferencing (see Section 2.2.1). In other words, contextual information may have been useful for semantic elaboration. Nevertheless, participants' cognitive resources were not sufficiently allotted to the context to be memorized based on words' properties. Consequently, information from context did not help the learner to recall the inferred word meaning.

Note that the explanations above do not deny the role of contextual information in lexical inferencing and subsequent vocabulary learning. Past L2 research has reported

that contextual information plays an important role in both L2 lexical inferencing (e.g., Hamada, 2011; Hamada, 2014; Nakagawa, 2006) and subsequent incidental vocabulary learning (Webb, 2008). However, these previous studies did not explore a condition whereby L2 learners had to recall the meanings of the target words based on the context of the sentences. Thus, the results of this study might further our understanding of the features of contextual clues in vocabulary learning through lexical inferencing.

6.3.3 Summary of Factors in Vocabulary Learning Through Lexical Inferencing

To sum up, the results of Experiments 4 and 5 suggest that a contextual sentence in which a word's meaning is inferred does not help learners to recall inferred word meanings, unlike word forms. This is because (a) being given a single opportunity to encounter unknown target words might not be sufficient for previously unacquired words to be reinforced in learners' memories, and (b) learners seem to sufficiently allot their cognitive resources to properties of unknown words (e.g., form, meaning)—but not the context—during inferencing, leading to the ineffectiveness of contextual information in recalling inferred word meanings.

Chapter 7
Conclusion

7.1 Major Findings of the Present Study

I explored how vocabulary learning through lexical inferencing by EFL learners would be influenced by clues available in text and learner proficiency, focusing on prefix availability, contextual informativeness, L2 vocabulary size, and reading proficiency. Previous studies have demonstrated that guessing the meaning of a word is a good resource for vocabulary learning. Past L2 literature has also shown that use of in-text clues is key to inferring the meaning of a word and retaining new vocabulary. However, interaction between learner proficiency and the types of clues that affect inference and new vocabulary acquisition still need to be examined. Thus, I aimed to address this research gap by administering five experiments upon EFL university students. The results of the five experiments allow me to conclude the findings of this study in terms of effects of prefix information in a word and its surrounding context, and the role of L2 vocabulary size in vocabulary learning through lexical inferencing using the in-text clues.

With regard to lexical inferencing, learners are able to infer the meaning of an unknown word while reading by making use of its morphemes, especially a prefix, and when the prefix and base are both available or already known to the learners. This is because they are sensitive enough to be aware of whether the morphemes in a word are available or unavailable to them, even at the level of bound or free morphemes (cf. Hamada, 2014). In contrast, contextual informativeness of a sentence that contains a word to be inferred seems not to solely affect inference performance of EFL learners; however, contextual information itself has been found to be one of the good resources for inferencing as well as a known prefix in an unknown word. However, use of these in-text

clues can be affected by the breadth of learners' L2 vocabulary knowledge, that is, the amount of L2 words they have learned. Although an in-word prefix known to learners is available for inference irrespective of the size of their L2 vocabulary knowledge, the ones with larger vocabulary size make use of the prefix information along with a known in-word base more effectively than the others, resulting in a successful inference. This is possibly on account of their high morphological awareness, or the ability to decompose a word into morphemes and then reflect on its whole meaning based on the morphemes (cf. Zhang & Koda, 2012). In addition to morphemes, EFL learners who have larger vocabulary size display better inferential performance compared to the others, possibly because they can switch clues that they rely on from morphological to contextual according to the availability of in-word clues.

As for vocabulary learning subsequent to lexical inferencing using the two in-text clues above, this study has generally confirmed two simple but fundamental views: Vocabulary learning through lexical inferencing cannot take place unless L2 learners succeed in inferring the meaning of a word (cf. Laufer, 2003; Nation & Webb, 2011), and an easily inferred meaning of a word is not easily retained (e.g., Haastrup, 1991). Specifically, compared to EFL learners with smaller vocabulary size, the ones with larger L2 vocabulary size perform better at recalling the meanings of words that are inferred even when their in-word prefix information is not available for inferencing; however, their surrounding context is informative enough. In terms of the former view above, this can be considered as a reflection of the number of successful inferences on the meaning of a word that learners make, which depends on their L2 vocabulary size as mentioned above. In the latter view above, this suggests two possibilities: First, switching clues to guess from morphological to contextual according to availability of in-word information may be part of the lexical-inferencing process that is demanding enough to facilitate

retention of the inferred meaning of a word. Second, performing this inferential process would require learners to gain high L2 proficiency, of which L2 vocabulary size can be indicative. However, this superiority of having large L2 vocabulary knowledge tends to diminish in a case where the meaning of a prefix in a novel word is known to them. This is explained by the finding above that in-word information is used regardless of learners' L2 vocabulary size, although the ones with larger vocabulary size make use of them effectively for inferencing. In contrast to in-word clues, a contextual sentence where the meaning of a word is itself inferred does not help the learners recall the meaning of the inferred word.

7.2 Limitations and Suggestions for Future Research

Although the present study has provided insightful findings on EFL learners' vocabulary learning through lexical inferencing, there are also limitations that should be addressed. These limitations are summarized into experimental design and materials.

Concerning the designs of the current study's experiments, I could not reveal the difference in terms of vocabulary size in the use of strategies and clues beyond text such as using prior knowledge. Although Experiment 2 addressed EFL learners' use of inferential strategies and clues using a think-aloud method, L2 vocabulary size was not taken into consideration as a factor making a difference. The result of this experiment shows that EFL learners with comparatively high L2 proficiency tended to increase use of their prior knowledge for inferencing as well as two other inferential strategies such as repeating phrases and paraphrasing part of a text; thus, one can assume that the difference between the two vocabulary-size groups in the scores on the prefix-unavailable, less informative context lexical-inferencing task found in Experiments 4 and 5 was possibly because the learners with larger vocabulary knowledge used clues outside text, such as

their prior knowledge. This yet unresolved result needs to be examined by experimenting with learners who vary in terms of L2 vocabulary size, and using measurements that can facilitate observation of the online process in which they engage during inferencing (e.g., a think-aloud method used in Experiment 2).

In addition, it is necessary to trace each participant's encounters with target words during the experimental period in details. In the two latest experiments, the participants were asked to report if they had looked up the target word in their dictionary by checking a box off in the recall test (i.e., a learning-confirmation test). However, there is still room for a possibility that the participants may have met the word somehow (e.g., one may have read a text where the target word appeared), and the word could have been learned by the participants, because they could have gone through the following learning processes: hypothesizing the meaning of the word (first-week experiment), confirming it (unexpected encounter before the second-week experiment), and then learning it incidentally (i.e., the participants would no longer need to search their dictionary, but they have already known the meaning). Taking this possibility into consideration, future research needs to confirm whether each participant has met target words before the learning-confirmation test using certain methods such as conducting a questionnaire.

As for the limitations on experimental materials, the passages used in the present study might be too short for readers to infer a word's meaning from contextual information. Using more authentic passages would be a good way to address this limitation. For example, de Bot and colleagues (1997), who investigated the knowledge resources that L2 learners drew on during inferencing, used a text about acid rain that was about 500 words long. Although the present study aimed to control some conditions strictly, it is probably better to make the experimental environment closer to real-life situations, such as reading long, difficult texts. Also, the passages may have been too easy

for EFL learners with university-level proficiency. To avoid this situation, the experiment should be administered to participants with different levels of proficiency ranging from novice (e.g., elementary-school pupils) to advanced (e.g., university students).

The last of the limitations pertains to the measurement of L2 reading proficiency. Previous studies examining the effect of learner proficiency on lexical inferencing (e.g., Hamada, 2014; Nakagawa, 2006) agree in that learners with high proficiency tend to achieve successful inference of the meaning of a word by flexibly using in-text clues (Hamada, 2014). Thus, I have taken L2 reading proficiency into consideration as a factor supposing that it plays a part in lexical inferencing and subsequent vocabulary learning in this study. After all, the present study, however, failed to yield a satisfactory result on account of the low reliability of the reading test. To be more specific, the items of the reading-proficiency tests used in this study were extracted from retired versions of the reading section of the EIKEN test, one of the most widely used standardized English tests in Japan. This test is classified into seven grades in terms of difficulty, ranging from Grade 5 to Grade 1. This feature is useful in creating a test that corresponds to test-takers' English proficiency. However, the reliability of the reading tests was not sufficient. As discussed in the previous chapter, this low reliability is attributed to the gap between reading proficiency among the participants and the range of measurement of the reading test, rather than the test's intrinsic unreliability on the evidence of the sufficient reliability coefficient of the one in Experiment 2. Future research using a reading test with a wide measurement range is recommended.

7.3 Implications from the Present Study

The findings of the present study will benefit both researchers of L2 vocabulary learning through lexical inferencing and teachers of EFL classes.

7.3.1 Implications for Researchers

The following three factors are recommended for researchers who study L2 vocabulary learning based on lexical inferencing: First, previous studies examining the contribution of morphological clues toward successful lexical inferencing can be divided into the following positions: (a) Morphological clues contribute to success in lexical inferencing (e.g., Zhang & Koda, 2012), and (b) morphological clues are not useful in inferring the meaning of unknown words (e.g., Nakagawa, 2006). This was possibly because these studies did not take into account whether learners knew the meanings of the morphemes in the target words. However, the present study revealed that EFL learners can harness morphological clues in unknown words for lexical inferencing when those morphemes are known to the learners. Thus, future research on L2 lexical inferencing should consider learners' knowledge of target words' morphemes, especially when a researcher plans to use existing words as target items.

Second, the findings of the present research revealed that ease of lexical inferencing does not necessarily contribute to retention of the inferred meaning of a word. Thus, to deepen the findings from this study, researchers should take into account the difficulty of a task when researching vocabulary learning through lexical inferencing; highly demanding lexical-inferencing tasks may result in lower rates of correct inference, whereas easy tasks may not contribute to effective vocabulary learning. There are two ways of adjusting task demands: selecting target words in terms of their morphological complexity, and manipulating the informativeness of experimental passages.

Last, as for the measurement of L2 reading proficiency, I would recommend the following two factors to researchers as a way of measuring university students' L2 reading proficiency in Japan: (a) If the researchers would refer to tests that are classified according

to levels of difficulty, such as the EIKEN test, to create an original reading test, it is recommended that they should adjust the range of difficulty by making it wider than assumed learners' L2 proficiency. In the case of this study, for example, I should have set items from Grade Pre-2 or 3 in a reading-proficiency test for the participants in the last three experiments; (b) it is also recommended to create a reading test with reference to the ones whose items range from beginner to advanced level in terms of test difficulty such as TOEFL, IELTS, and so forth.

7.3.2 Implications for EFL Educators

The findings of the present study may provide some clues on successfully instructing and evaluating lexical inferencing, leading to efficient vocabulary learning.

This section will address how one engaging in the teaching of English as a second or a foreign language (TESL or TEFL) can successfully enable their students to learn vocabulary from reading with reference to Nation's (2013) suggestion on designing a curriculum for vocabulary teaching. In his suggestion, Nation argues that one should take the following three principles of vocabulary teaching into consideration when designing a course curriculum (pp. 572–580): (a) *Content and sequencing* refers to what vocabulary is focused on and how it is divided into stages (e.g., providing adequate training in essential strategies for vocabulary learning); (b) *format and presentation* involves how the vocabulary is taught and learned (e.g., providing opportunity for deep processing of vocabulary); and *monitoring and assessment* pertains to how learning is measured (e.g., testing how well learners have fluent control of the strategies).

Based on his suggestion, possible ways of applying the present study's findings to vocabulary teaching are stated in the upcoming sections: Regarding content and sequencing, I will propose possible ways of instructing lexical inferencing focusing on

strategic use of morphological and contextual clues in Section 7.3.2.1. The subsequent section will deal with format and presentation in terms of the degree of task burden and retention. Finally, as for monitoring and assessment, I will discuss the possibility of a multiple-choice lexical-inferencing task to observe the difficulties that students experience during inferencing in Section 7.3.2.3.

7.3.2.1 Teaching Lexical Inferencing Using Morphological and Contextual Clues

Past research has revealed that L2 students succeed in making a successful guess of the meaning of a compound word consisting of two English words in a case where they know either of these words (Hamada, 2014). The present study has taken this finding one step further by showing its applicability at a smaller, more complex level of bound morphemes, such as affixes. It should, however, be noted that the finding of the present study becomes applicable in a situation where learners know the meanings of both the prefix and the base in the target word. Taken together, these suggest increasing the amount of knowledge on affixes in English words, as listed in Nation's (2013) ,by teaching their meanings.

Meanwhile, it is recommended to teach students not to excessively rely on morphological knowledge, and to increase their sensitivity to the availability of morphological clues in words. In-word clues usually involve the meaning of a whole word (e.g., the prefix *un-* expresses a negative sense, so the word *unhappy* denotes the state of not being happy); however, every rule has its exceptions (e.g., the words *uncanny* and canny are not in an antonymous relation). Based on this fact, one potential activity is to have students list words with the same prefix and check whether the prefix is useful for understanding each word. In doing so, students incidentally come to know that parts of words are not always useful for inferring their meaning.

Besides this, raising students' sensitivity to the availability of in-word clues may be effective both in improving their morphological awareness and in promoting students' selective use of clues not only in analyzing, but also in other strategies such as using prior knowledge to infer the meaning of a word. For the former possibility, the result of this study has suggested that performance of lexical inferencing with in-word prefix information can be influenced by learners' L2 vocabulary size on account of morphological awareness. As this is an ability to decompose a word into morphemes, and subsequently reflect on its whole meaning based on the morphemes (Zhang & Koda, 2012), it may be worth assigning activities to students such as asking them to divide a morphologically difficult word into morphemes, and reflect on the whole meaning (e.g., extracting the meaning of the word *unexpectedly* based on its morphemes: *un-*, *expect*, *-ed*, *-ly*). As for the latter possibility, the think-aloud experiment in this study revealed that EFL learners at a university-student level proficiency tended to increase the use of certain inferential strategies such as repeating the phrase, trying to determine its meaning using prior knowledge, or constructing a phrase in which the meaning of the word might be easier to infer according to the availability of in-word clues. Note that to encourage this to take place, it is desirable that (a) a target word is a morphologically complex word whose in-word clues are unfamiliar to students, and (b) is presented in a sentence or a passage whose contextual information is familiar enough to arouse their background knowledge such as school life (e.g., "Even after graduating from university, you can continue studying as a *postgraduate* if you wish," in a case where the word *postgraduate* is a target word, and its prefix *post-* is not known to students).

7.3.2.2 Creating an Inferencing Task Whose Demands Contribute to Retention

The result of this study is consistent with the fact that guessing from context is a prerequisite for learning vocabulary from reading (Nation & Webb, 2011). An easily inferred meaning of a word, however, is not easily retained (Haastrup, 1991). That is, having students to be able to easily infer the meaning of a word does not necessarily lead to better retention by them, and the findings of this study have confirmed this. Based on the notion above and the present study's result, this section will address what a task that encourages students to learn English words through lexical inferencing is like.

The results of the experiments in this study have suggested two conditions where EFL university students varying depending on the size of their L2 vocabulary knowledge would retain the inferred meaning of a word. One of these is a case where in-word clues such as a prefix and base are known to students. This situation tends to facilitate successful inferences in total irrespective of the students' L2 vocabulary size, which possibly leads to increase in retention of more words. Specifically, the discussion developed in the previous chapter has touched on the possibility that having vocabulary knowledge of approximately 3,000 English words would enable EFL learners to make successful guesses of the meaning of an unknown word using knowledge on its prefix and base. Therefore, it may be a good idea that if an English teacher would like their students to be able to learn words from text by themselves, but their L2 vocabulary knowledge is judged as below 3,000 words, they should prepare sentences whose targets are unknown, or make low-frequency words that have in-word clues available to the students (e.g., "For some *unaccountable* reason, my computer has suddenly shut down," in a case where students know all morphemes of the target word *unaccountable*; *un-*, *account*, *-able*).

In contrast, students whose L2 vocabulary size is at or over 3,000 words are considered proficient enough to infer the meaning of an unfamiliar word based on its morphemes known to them. This means that lexical inferencing using morphological clues may not be so demanding for them that they could not properly retain the meaning of a word. The general discussion in Chapter 6 has related the following possibilities: First, switching clues to guess from morphological to contextual according to availability of in-word information may be part of the lexical-inferencing process that is demanding enough to facilitate the retention of the meaning of the inferred word. Second, performing this inferential process would require learners to gain high L2 proficiency, of which L2 vocabulary size can be indicative. Taken together, these provide a useful implication for an English teacher who would like their students to gain vocabulary knowledge from reading; that is, it is recommended for the teacher to create a test whose items have sentences that are informative enough to ensure inference of the meanings of target words but their in-word clues are not familiar to their students (e.g., "Since he was very busy recently, Ken is thinking of going to the hot spring to *unwind* from daily tiredness," in a case where the two morphemes in the target word *unwind* seem available to students, but the meaning of its base is actually not their accustomed one [i.e., moving air]; therefore, they would need to switch clues to infer from morphological to contextual).

7.3.2.3 Assessing Students' Difficulty in Inferencing Using a Multiple-Choice Task

One of the experiments in the current study has explored the possibility of a simple paper-based task for observing the process EFL university students engage in during lexical inferencing. To address this purpose, I created a paper-and-pencil lexical-inferencing task where an experiment passage that contains a target word is followed by four different choices that are under the two prefix-availability conditions crossed by the

two context ones (see Chapter 4 for more detail). Its result is as follows: EFL learners infer a word's meaning by combining clues such as information from the prefix within the target word and context of the sentence, and this process can be observed through a paper-based multiple-choice lexical-inferencing task, performance of L2 vocabulary-size test predicts the selectivity of choices in the inferencing task to some extent, and EFL learners with low L2 proficiency tend to depend on morphological clues because the use of contextual information requires a certain degree of L2 proficiency. Taken together, these allow me to suggest that it is possible for a teacher to create a task to evaluate the students' strategic use of in-text clues for inferencing. Moreover, the result of the task may help the teacher grasp what part of the lexical-inferencing process in which their students may have difficulty engaging is like and give feedback that encourages their students to reflect on their inappropriate use of clues.

7.4 Concluding Remarks

Successful lexical inferencing and subsequent vocabulary learning are both necessary for learners to be able to comprehend what the text they are reading is about without help, or to gain a considerable amount of vocabulary knowledge. However, these two are complicated in that although lexical inferencing is a skill that learners tend to fail in the first place, being good at performing this does not necessarily lead to success in retaining them. This is why both researchers and teachers of TESL or TEFL have been interested in and working on examining how lexical inferencing and incidental vocabulary learning are affected by factors such as linguistic (e.g., morphemes, textual context) and learner proficiency (e.g., vocabulary knowledge, reading proficiency), and so on. Although there are still some limitations left unsolved, the findings of the present study above have taken the discoveries of past studies on text-based lexical inferencing

and subsequent vocabulary learning by L2 learners with different vocabulary proficiency one step further, especially in accounting for the relationship between use of in-text clues, learners' vocabulary size, and learning vocabulary from reading.

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Appendices

Appendix A: *Prefix test in Norming Study 1 of Experiment 1*

【接頭辞テスト】　　お名前：＿＿＿＿＿＿＿＿＿＿

提示されている語の下線が引かれている部分の意味を下の欄に日本語で記入し、難易度を○で囲ってください

例. autoscrout　autojarg　autothrode

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：　自動の　　勝手に動く　　※複数の意味を知っている場合は、その意味をすべて書いてください				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	②	3	4	5

1. antiphlonnth　antiwomped　antisikced

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

2. antebrarnde　antegloarced　antesprooz

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

3. archcleighze　archdoxe　archsckacte

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

4. biscowd　bikuncks　bisprolled

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

5. circumdwurs circumscryx circumkwinned

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

6. countergaughnde counterkreighced counterskroxe

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

7. exvyned exdrountz exzeighned

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

8. foresmuinde foresorernd foresckwaxt

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

9. hyperblouned hypergwownde hypersprould

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

10. intersnornd　interkeps　interwuist

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

11. midskroarze　midthwecked　midcwampce

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

12. missckwoize　miscripse　misvirred

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

13. neosneksed　neoscrerste　neoshens

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

14. postsprand　postpeand　postgarrs

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

15. protealed　prosciend　prosamps

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

16. semifrepce　semihimpse　semispiste

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

17. subgined　subclince　subloased

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

18. ungucs　uncrence　untwipt

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

19. prequood　preskreast　presourld

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

20. redeast　reskwoaned　recroize

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

21. abtuised　abcald　abjucks

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

22. advynx　adhogns　advifte

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

23. complogns　compapped　combrownt

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

24. dewund　deneude　demoust

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

25. discrunce　disgused　dispreed

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

26. objunst　obvade　obdencs

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

27. persleesed　perprounse　perbynce

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

28. transnist　transtreft　transmerled

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

29. nonsneend　nonponx　nondrerst

下線を引いた部分の意味を下の欄に日本語で記入してください。				
意味：				
下線を引いた部分の意味の判断の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

Appendix B: *Lexical-inferencing task in Experiment 1*

未知語推測タスク

英文中にある単語の意味を推測していただく問題です。

注意事項

- 下線の引かれている単語の意味を推測して、その推測した意味をすべて日本語で解答欄に記入してください。
- 下線が引かれている単語をすでに知っているかどうかを判断し、「この単語を知っていましたか？」という欄の「はい」または「いいえ」のいずれかのボックスにチェックを入れてください。
  ※ここでいう「知っている単語」とは、語の一部分だけ知っているのではなく、あくまで「語全体の形を知っている or 見たことがある単語」を指します。
- それぞれの文で、下線の引かれている単語の意味が推測しやすかったかどうかを１～５段階の中から選び、〇で囲ってください。
- 問題は全部で 22 問あります。
- すべての解答欄を埋めてください。分からない単語も、出来るだけ意味を推測して解答してください。
- 下線が引かれている単語以外の箇所でわからない単語または表現などがあれば、その下に下線を引いてください。

問題例と回答記入方法

例題

To my surprise, the lake looked like a semicircle. And I decided to walk around it for a while.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。	この単語を知っていましたか？
意味： **半分の丸形**	□はい ☑いいえ

この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで〇で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	②	3	4	5

問題は次のページから始まります。
指示があるまでめくらないでください。

1

Here is the book I was talking about. The main character in this book is a good example of an antihero.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

2

I heard a news story about a crime which happened this morning. The reporter said unrest was spreading all over the town.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

3

When Peter and I met here for the first time, he worked as a subeditor at the local paper.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

4

Adjudgment will be given on the case in a week. It has begun to attract people’s interest.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

5

He said that I was his archenemy. I was surprised and wondered how we had arrived at a situation like this.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

6
There was some abnormality in his vision. He thought that he had to work much harder than before.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

7
I took a peruse through my list of tasks for the day to make sure they were completed, then made a reservation for dinner.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

8
The exact time of excommunication is not clear; it is said to be just after the death of the king in 1895.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

9
I didn't know what to do. Then, my husband suggested going to the midship to attend the party.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

10
There is an increasing interest in a new book about neogeography. It is written in simple English, so it is easy to understand.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

11
Today’s weather caused me much discomfort. I went home as soon as possible after school finished.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

12
This biplane was designed by a Spanish engineer. He was very glad that it soon became popular.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

13
Large areas of the country have been suffering from depopulation, but the government has not found a perfect solution yet.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

14
After you draw an oblong in the center of the sheet, write your name in it. This will be your name tag.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

15
One of the members is a protractor in everything. He will not stop talking until he becomes satisfied.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

16
This era saw a big change in natural science. Therefore, a redescription of many species of animals was necessary.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

17
If you tell any nonmember about this paper, you will be killed immediately. It’s a top-secret document.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

18
Mary had the compassion to offer help when it was needed most. That's why she was loved by the group.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

19
I am saving money for a circumnavigation of the globe. I'm looking forward to visiting many famous places so much.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

20
As Mary was crossing the anteroom, she saw a man through the window. She believed him to be her brother.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

21
The misdirection of this country is pretty clear to us all. The government should discuss a solution to the problem right now.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

22
We are learning about the prehistory of this country. The textbook says this land used to be under the sea.

この英文中の下線が引かれた語の意味を下の欄に日本語で記入してください。				この単語を知っていましたか？
意味：				□はい　□いいえ
この英文中の下線が引かれた語の意味の推測の難易度を下の選択肢から選んで○で囲ってください。				
簡単	やや簡単	ふつう	やや難しい	難しい
1	2	3	4	5

未知語推測タスクは以上ですべてです。全て解き終わりましたら、調査者にお知らせください。

Appendix C: *Experimental sentences of lexical-inferencing task in Experiment 2*

(a): more informative context (+informative) condition

(b): less informative context (–informative) condition

(Note that target words are underlined.)

1. antihero

(a) Everyone knows Mike was very good at acting. He always played the role of the antihero in drama.

(b) Here is the book I was talking about. The main character in this book is a good example of an antihero.

2. redescription

(a) There is a page that needs a redescription right now in this book. I wonder why no one noticed it.

(b) This era saw a big change in natural science. Therefore, a redescription of many species of animals was necessary.

3. nonmember

(a) If you are a nonmember, please enter your name and email address here. If not, please click the button below.

(b) If you tell any nonmember about this paper, you will be killed immediately. It's a top-secret document.

4. unrest

(a) A new period of unrest began, following the September 11th terrorist attacks in the United States.

(b) There is unrest growing in the east of the country after a terrible earthquake occurred.

5. subeditor

(a) Anderson is one of my old friends. He used to be a subeditor of this journal, but he has already quit.

(b) Our boss is on vacation, so I have to check all the articles as a subeditor.

6. adjudgment

(a) A man smiled in the court when he was given the adjudgment saying that he was not guilty.

(b) Some of these dangerous actions were not limited by adjudgment in 1970 because people at that time didn't know they were harmful.

7. archenemy

(a) Samuel is Jack's archenemy. They have hated and sometimes fought against each other.

(b) This text suggests that he was such a powerful knight that even his archenemy recognized his power.

8. abnormality

(a) There was some abnormality in his vision. He thought that he had to work much harder than before.

(b) My brother said there was something wrong with his car, but I didn't find an abnormality in it.

9. peruse

(a) Peruse your list of tasks for the day to make sure they are completed.

(b) Peruse our web page and then give us a call. We can't wait to work with you.

10. anteroom

(a) We were sitting in chairs in the anteroom to the hall, waiting for the doors to open.

(b) My father led the visitors through the anteroom into a small hall. They seemed to be very important guests.

11. excommunication

(a) Since the excommunication in 1991, he has said that the relationship between the group and himself had already ended.

(b) He used to be a member of our community. However, after the excommunication, I haven't seen him.

12. compassion

(a) Mary had the compassion to offer help when it was needed most. That's why she was loved by the group.

(b) My friend was so kind that she felt compassion for me when I was sad at the news of my father's death.

13. midship

(a) We enjoyed dancing on the ship for America. Suddenly it began to rain, so we went back to the midship section.

(b) I didn't know what to do. Then, my husband suggested going to the midship section to attend the party.

14. misdirection

(a) The misdirection of this country is pretty clear to us all. The government should discuss a solution to the problem right now.

(b) We all did what the man said, but failed in business. I think his order was misdirection.

15. prehistory

(a) We are learning about the prehistory of this country. The textbook says this land used to be under the sea.

(b) My father is a professor of prehistory. He studies the period of time in the past before people could write.

16. neogeography

(a) The development of information technology gave birth to neogeography. Nowadays, many people use it.

(b) There is an increasing interest in a new book about neogeography. It is written in simple English, so it is easy to understand.

17. discomfort

(a) Today's weather caused me much discomfort. I went home as soon as possible after school finished.

(b) We understand your discomfort, but please be patient. We will fix the air conditioning as soon as we can.

18. biplane

(a) I used to fly a biplane. After I crashed and got injured, I quit flying and began working as an engineer.

(b) This biplane was designed by a Spanish engineer. He was very glad that it soon became popular.

19. depopulation

(a) The number of people living in this town has been going down. In other words, the town has been suffering from depopulation.

(b) Large areas of the country have been suffering from depopulation, but the government has not found a perfect solution yet.

20. circumnavigation

(a) I'm really looking forward to circumnavigation. I want to visit India, Egypt, Spain, Brazil, and so on.

(b) I am saving money for a circumnavigation of the globe. I'm looking forward to visiting many famous places so much.

21. oblong

(a) After you draw an oblong in the center of the sheet, write your name in it. This will be your name tag.

(b) When people die, they are always buried in oblong boxes in most parts of Europe and America. However, dead people are burned in East Asia.

22. protractor

(a) I don't think the meeting will finish early because the chairperson is known as a protractor. It should last until 6 p.m.

(b) One of the members is a protractor in everything. He will not stop talking until he becomes satisfied.

Appendix D: *Lexical-inferencing task in Experiment 3*

所属・学年:	学籍番号:	氏名:

未知語推測タスク

英文中にある単語の意味を推測し，その推測した意味に合う選択肢を選ぶ課題です。22 問あります。

解答方法

- 下線の引かれている単語の意味を推測してください。
- 下線が引かれている単語をすでに知っているかどうかを判断し、「この単語を知っていましたか？」という欄の「はい」または「いいえ」のいずれかのボックスにチェックを入れてください。
- 推測した意味に合う選択肢の数字を〇で囲ってください。
- ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。

注意

- ここでいう「知っている単語」とは、語の一部分だけ知っているのではなく、あくまで「語全体の形を知っている or 見たことがある単語」を指します。
- すべての解答欄を埋めてください。分からない単語も、出来るだけ意味を推測して解答してください。

下線が引かれている単語以外の箇所でわからない単語または表現などがあれば、その下に下線を引いてください。

例

After the interruption, she <u>proceeded</u> with her presentation.

① この単語を知っていましたか？			□はい ☑いいえ		
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。					
1. the activity of making, buying, or selling goods or providing services ② the act of going or moving forward 3. a person who likes to talk a lot 4. someone who draws out something for longer than the usual amount of time					
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。					
非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	③	4	5	6

問題は次のページから始まります。
指示があるまでめくらないでください。

1.
Everyone knows Mike was very good at acting. He always played the role of the antihero in drama.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a main character who does not have qualities that a hero usually has 2. a person against a fight, conflict, war, etc. 3. an important person who appears in a story, movie, etc. 4. a person who makes or fixes wooden parts of buildings	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

2.
There is a page that needs a redescription right now in this book. I wonder why no one noticed it.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the act or process of cleaning something 2. writing something again to change the content of text 3. a mark that is very hard or impossible to remove 4. saying the same thing again	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

3.
If you are a nonmember, please enter your name and email address here. If not, please click the button below.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a person who is not a friend or member of a group, company, etc. 2. a person who cannot read or write any English word 3. a type of animal that is closely related to monkeys and humans 4. someone who teaches English at school	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

4.
A new period of unrest began, following the September 11th terrorist attacks in the United States.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. making the army stronger to save the country 2. an organization or situation in which everyone is treated equally 3. a situation in which a person is not lucky to do 4. a situation in which people do not feel at peace	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

5.
Anderson is one of my old friends. He used to be a subeditor of this journal, but he has already quit.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a person who sells something at a store 2. someone who is under the king 3. a person who has graduated from college 4. a person who checks articles under the chief editor	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

6.
A man smiled in the court when he was given the adjudgment saying that he was not guilty.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the group of people who control and make decisions for a country, state, etc. 2. a set of tools people use when they want to add sugar 3. a statement that tells someone to do something 4. a piece of information that is sent or given from a judge to someone	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

7.
Samuel is Jack's archenemy. They have hated and sometimes fought against each other.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the strongest person in the world. 2. someone who hates another 3. someone's main and the most powerful enemy 4. someone who is in the same group	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

8.
There was some abnormality in his vision. He thought that he had to work much harder than before.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. something that is away from a usual status 2. something that goes away from you 3. a list or schedule of events or activities 4. something that is not easy to do	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

9.
Peruse your list of tasks for the day to make sure they are completed.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. to make something clear or easy to understand 2. to make something by putting together parts perfectly 3. to get information by looking at something 4. to read something completely.	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

10.
We were sitting in chairs in the anteroom to the hall, waiting for the doors to open.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a large place that is filled with water 2. a small room that is in front of a larger room 3. a place in front of the school 4. a room that has things for sports activities or exercise	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

11.
Since the excommunication in 1991, he has said that the relationship between the group and himself had already ended.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. making someone be out of a group 2. entering the prison 3. going on a trip 4. getting out of a car	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

12.
My friend was so kind that she felt compassion for me when I was sad at the news of my father's death.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a feeling of wanting to share the suffering of someone together 2. the act of making your thoughts, feelings, etc., known by speech, writing, etc. 3. a feeling of sadness or grief caused especially by the loss of someone or something 4. the act of getting things together	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

13.
I didn't know what to do. Then, my husband suggested going to the midship section to attend the party.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. in front of the house 2. the middle point of the marathon race 3. space under the roof 4. a middle part of the ship	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

14.
We all did what the man said, but failed in business. I think his order was misdirection.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the act of directing something in a wrong way 2. something too difficult to do completely 3. something that is given to another person 4. the act of saying something by mistake	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

15.
My father is a professor of prehistory. He studies the period of time in the past before people could write.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a course of study about human relationships and the way society works 2. a test given before teaching something 3. human culture before the written word appears 4. the science of numbers, quantities, and shapes and the relations between them	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6

16.
There is an increasing interest in a new book about neogeography. It is written in simple English, so it is easy to understand.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，○で囲ってください。	
1. the status of being new to a place 2. the use of new techniques and tools for personal and community activities 3. the act of starting a new life 4. activity that is against the law	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，○で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

17.
We understand your discomfort, but please be patient. We will fix the air conditioning as soon as we can.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，○で囲ってください。	
1. a feeling of being somewhat not happy 2. an activity with someone you love 3. the act of paying no attention to someone 4. the act or event that causes someone to be in bad condition	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，○で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

18.
This biplane was designed by a Spanish engineer. He was very glad that it soon became popular.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，○で囲ってください。	
1. an electronic machine that can store and work with a lot of information 2. a type of airplane that has two sets of wings 3. a large animal that is used for riding and for carrying things 4. a thing that has two legs and uses them to walk	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，○で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

19.
Large areas of the country have been suffering from depopulation, but the government has not found a perfect solution yet.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. something that happens suddenly and causes much suffering or loss to many people 2. the act of traveling from one place to another 3. greatly decreasing the number of people living in the area 4. the act of reducing dangerous substances in land, water, air, etc.	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

20.
I am saving money for a circumnavigation of the globe. I'm looking forward to visiting many famous places so much.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the activity of visiting the famous or interesting places of an area 2. the act, activity, or process of finding the way to get to a place 3. the act of traveling all the way around something in a ship, airplane, etc. 4. the length of a line that goes around something or that makes a circle or other round shape	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

21.
When people die, they are always buried in oblong boxes in most parts of Europe and America. However, dead people are burned in East Asia.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. a kind of shape which is longer in one direction than in the other direction 2. a thing in which a dead person is in 3. a long distance from one end to the other end 4. the relationship between a husband and a wife	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	
非常に自信がない　自信がない　あまり自信がない　すこし自信がある　自信がある　非常に自信がある 1　2　3　4　5　6	

22.
One of the members is a <u>protractor</u> in everything. He will not stop talking until he becomes satisfied.

① この単語を知っていましたか？	□はい　□いいえ
② この英文中の下線が引かれた語の意味として適切なものを次の１～４の中から１つ選び，〇で囲ってください。	
1. the activity of making, buying, or selling goods or providing services 2. the act of going or moving forward 3. a person who likes to talk a lot 4. someone who draws out something for longer than the usual amount of time	
③ ②の解答にどれくらい自信があるかを１～６段階の中から１つ選び，〇で囲ってください。	

非常に自信がない	自信がない	あまり自信がない	すこし自信がある	自信がある	非常に自信がある
1	2	3	4	5	6