The Relationship Between Depth of Vocabulary Knowledge and L2 Learners’ Lexical Inferencing Strategy Use and Success

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This study examines the relationship between English as a second language (ESL) learners’ depth of vocabulary knowledge, their lexical inferencing strategy use, and their success in deriving word meaning from context. Participants read a passage containing 10 unknown words and attempted to derive the meanings of the unknown words from context. Introspective think-aloud protocols were used to discover the degree and types of inferencing strategies learners used. The Word-Associate Test (WAT) (Read, 1993) was used to measure the learner’s depth of vocabulary knowledge. Results indicate a significant relationship between depth of vocabulary knowledge and the degree and type of strategy use and success. They reveal that (a) those who had stronger depth of vocabulary knowledge used certain strategies more frequently than those who had weaker depth of vocabulary knowledge; (b) the stronger students made more effective use of certain types of lexical inferencing strategies than their weaker counterparts; and (c) depth of vocabulary knowledge made a significant contribution to inferential success over and above the contribution made by the learner’s degree of strategy use. These findings provide empirical support for the centrality of depth of vocabulary knowledge in lexical inferencing and the hypothesis that lexical inferencing is a meaning construction process that is significantly influenced by the richness of the learner’s preexisting semantic system.

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INTRODUCTION

One of the central cognitive processes in reading comprehension is inferencing (R. C. Anderson & Pearson, 1984; Graesser & Bower, 1990; Kintsch, 1988, 1998; Monzo & Calvo, 2002; Nassaji, 2002, 2003a, 2003b; Whitney, 1987). Inferencing has been defined as the connections that people establish when they try to interpret texts (G. Brown & Yule, 1983). Inferencing occurs at all levels of the reading comprehension process, ranging from integrating the text with background knowledge (Kintsch, 1988), to connecting the different parts of the text together (Garrod & Sanford, 1990; Kintsch, 1988, 1998), to linking known to unknown elements in the text in order to arrive at a coherent structure of the information in the text (Garrod & Sanford, 1990; Graesser & Bower, 1990; Graesser & Zwaan, 1995). Such processes are assumed to involve prediction and interpretation of the text for meaning; hence, they are considered important processes by theories in cognitive psychology that conceptualize reading as an active meaning-construction process and a creation of a mental representation of the text (Kintsch, 1988, 1998).

The present study focused on lexical inferencing, that is, making “informed guesses” about the meaning of unknown words based on the available linguistic and nonlinguistic cues in the text (Haastrup, 1991, p. 40). Lexical inferencing has been found to be widely used by second language (L2) learners when dealing with unknown words in their reading (de Bot, Paribakht, & Wesche, 1997; Frantzen, 2003; Fraser, 1999; Huckin & Bloch, 1993; Morrison, 1996; Paribakht & Wesche, 1999; Parry, 1993). Lexical inferencing has also been found to be closely associated with incidental vocabulary learning, that is, learning vocabulary through reading natural texts (Huckin & Coady, 1999; Nagy, 1997). Thus, Wesche and Paribakht (1999) argue that “much—if not most—lexical development in both L1 and L2 appears to occur as learners attempt to comprehend new words they hear or read in context” (p. 176).

Although researchers have attributed an important role to lexical inferencing, the nature of this process has not been well understood in second language acquisition (SLA) (Paribakht & Wesche, 1999). To this end, and given the important role currently attributed to L2 learners’ lexical knowledge in L2 reading comprehension (Laufer, 1996, 1997; Nassaji, 2002, 2003a; Nation, 2001; Qian, 2002; Read, 1993, 1997, 2000), the present study examined the particular role learners’ depth of vocabulary knowledge plays in lexical inferencing. The question addressed was, How does L2 learners’ depth of vocabulary knowledge relate to the degree and the type of the lexical inferencing strategies they use, and how does this relationship affect the learners’ success in deriving word meaning from context?

Factors Affecting Learners’ Success in Lexical Inferencing

Many factors have been shown to affect success in lexical inferencing, including the nature of the word and the text that contains the word (Paribakht & Wesche, 1999; Parry, 1993); the degree of textual information available in the surrounding context (Dubin & Olshatine, 1993); the learner’s ability to make use of extratextual cues (de Bot et al., 1997; Haastrup, 1991); the importance of the word to comprehension of the text (C. M. Brown, 1993); the degree of cognitive and mental effort involved in the task (Fraser, 1999; Joe, 1995); and the learner’s attention to the details in the text as well as his or her preconceptions about the possible meaning of the word (Frantzen, 2003). In a discussion of the factors involved in lexical inferencing, Nagy (1997) considers the role of learners’ pre-existing knowledge bases and how these knowledge bases influence learners’ strategy use and success. Nagy groups learners’ knowledge bases into three main categories: linguistic knowledge, world knowledge, and strategic knowledge. The linguistic knowledge category covers all knowledge that learners possess about the linguistic context in which the word has occurred, including their syntactic knowledge, lexical knowledge, and knowledge of word schema (i.e., knowledge of the possible meanings of the word). World knowledge is the learner’s understanding and use of the relevant domains of knowledge. Strategic knowledge is knowledge of the actual strategies learners employ during the act of inferencing and attempting to deduce the meaning of the unknown word from context. Nagy suggests that strategic knowledge may not be necessary for acquiring word meaning from context, but that sometimes, when the learner is aware of the existence of new words in the text, he or she may make deliberate attempts to derive the meanings of these words from context. Nagy then reviews several studies that have highlighted the importance of such strategic attempts in deriving word meaning from context (Buikema & Graves, 1993; Huckin & Jin, 1987; Jenkins, Matlock, & Slocum, 1989).

Similarly, in a discussion of what is involved in successful strategy use, Pressley, Borkowski, and Schneider (1987) propose a framework that
distinguishes between a cognitive strategic component, which includes a repertoire of general as well as domain-specific strategies learners have, and a knowledge-base component, including various knowledge bases constructed from learners’ various experiences with the world. These knowledge bases range from well-established and integrated pieces of information about particular phenomena or situations, to knowledge about specific strategies and skills, to knowledge about when and how to apply these in a particular situation. Knowledge the strategy user needs to evaluate the causes of his or her failure and the relationship between his efforts and achievement also fall into this category.

In the context of L2 lexical inferencing, and based on an exploratory study with intermediate English as a Second Language (ESL) learners, Huckin and Bloch (1993) propose a lexical inferencing model that incorporates similar components. These components include a knowledge module component (e.g., a vocabulary knowledge module, a text schema module, a syntax and morphology module, and a text representation module) and a metalinguistic strategic component. The metalinguistic strategic component includes a sequence of cognitive and decision-making strategies that the learner uses when trying to generate and test word meanings and hypotheses. According to Huckin and Bloch, these strategies play an important role in lexical inferencing in that they help the learner decide when and how to proceed and seek help from context and various sources of knowledge available.

The above frameworks underscore the multidimensionality of strategy use. In particular, they highlight the fact that multiple knowledge sources and strategies (i.e., the various cognitive and metacognitive activities learners use when identifying and constructing word meaning from context) are involved in inferencing word meanings from context. A number of recent studies have documented the range of knowledge sources and strategies learners employ during lexical inferencing (Chern, 1993; de Bot et al., 1997; Haynes, 1993, Huckin & Bloch, 1993; Morrison, 1996; Paribakht & Wesche, 1999). For example, in a study with university students, de Bot et al. (1997) found that when attempting to infer word meaning from context, L2 readers used knowledge sources ranging from knowledge of grammar, morphology, phonology, and knowledge of the world, to knowledge of punctuation, word association, and cognates. Analyzing the lexical inferencing strategies of Danish learners of English, Haastrop (1991) found that learners used different strategies ranging from those related to the internal structure of the word (such as analysis of the phonological and orthographic structure of the word) to those involving the use of top-down contextual and sentence-level clues.

Among the knowledge sources, one type of knowledge source that has been found to be strongly related to the learner’s ability to read and understand texts is vocabulary knowledge. A number of studies in both L1 and L2 have demonstrated that vocabulary knowledge is one of the best predictors of reading ability and the ability to acquire new information from texts (J. C. Anderson, 2000; Nation, 2001; Qian, 2002; Read, 2000). Several studies have also demonstrated a relationship between learners’ vocabulary knowledge and their subsequent learning of vocabulary through reading (Haynes & Baker, 1993; Parry, 1997; Pulido, 2003; Sternberg & Powell, 1983; Verspoor & Lowie, 2003). In a study with L1 learners, for example, Sternberg and Powell (1983) found a positive relationship between learners’ performance on a vocabulary test and their ability to define word meanings. In a recent study with Dutch learners of English, Verspoor and Lowie (2003) found a similar relationship. The researchers found that learners’ ability to infer and retain the meanings of polysemous words from context was related significantly to their knowledge of the core sense of the word. In another study with L2 learners, Pulido (2003) found that knowledge of sight vocabulary was significantly correlated with measures of incidental vocabulary gains from reading.

**Depth Versus Breadth of Vocabulary Knowledge**

In research on vocabulary learning, a distinction has often been made between two dimensions of vocabulary knowledge: depth of knowledge and size, or breadth of knowledge (Haastrop & Henriksen, 2000; Meara, 1996; Read, 2000). Breadth of vocabulary knowledge has been taken to refer to the quantity or number of words learners know at a particular level of language proficiency (Nation, 2001). Researchers have used various types of assessment tools with different formats to measure this dimension of vocabulary knowledge, including tests that require the learner to identify a synonym for a word in a multiple-choice test, match words with definitions, translate a word into L1, or use checklists (see Wesche & Paribakht, 1996, for a discussion of these various assessment types). One measure that has been widely used to assess size of vocabulary knowledge in the literature, for example, is Nation’s Vocabulary Level

test (1990, 1993), which has a word–meaning matching format and is composed of words representing different word frequency levels, ranging from high-frequency (2,000 word level) to low-frequency words (10,000 word level).

Depth of vocabulary knowledge, on the other hand, has been used to refer to the quality of lexical knowledge, or how well the learner knows a word (Meara, 1996; Read, 1993, 2000). Researchers have noted the complexity and multidimensionality of word knowledge and have suggested that knowing a word well should mean more than knowing its individual meanings in particular contexts. Various kinds of knowledge are associated with a word that a learner must know, ranging from knowledge related to its pronunciation, spelling, register, stylistic, and morphological features (Haastrup & Henriksen, 2000; Meara, 1996; Nation, 1990; Richards, 1976) to knowledge of the word’s syntactic and semantic relationships with other words in the language, including collocational meanings and knowledge of antonymy, synonymy, and hyponymy (Chapelle, 1994; Henriksen, 1999; Read, 2000).

Studies investigating the role of vocabulary knowledge in reading have found that while measures of size of vocabulary knowledge are strongly related to the reader’s understanding of texts (Laufer, 1997; Qian, 1998, 1999), measures examining aspects of depth of vocabulary knowledge make a stronger contribution to reading performance than those that simply measure a single definition of a word. Qian (1999), for example, found that depth of vocabulary knowledge, conceptualized as receptive knowledge of word meanings and collocations, was not only a better predictor of L2 reading comprehension but also made a unique contribution to L2 reading comprehension, over and above the contribution made by size of vocabulary knowledge.

In the present study, expanding on this line of research, I attempted to discover the role of L2 learners’ depth of vocabulary knowledge in L2 lexical inferencing. In particular, I examined how L2 learners’ depth of vocabulary knowledge relates to the degree and type of lexical inferencing strategy use and how this relationship mediates learners’ success in deriving word meaning from context. I also investigated the degree to which depth of vocabulary knowledge and degree of lexical inferencing strategy use contribute, collectively and independently, to learners’ inferential success. If it could be shown that lexical inferencing strategies make any contribution to lexical inferencing success, this could have important implications for models of L2 vocabulary instruction that advocate the use of lexical inferencing strategy in L2 vocabulary acquisition.

**METHOD**

The data examined in the present study come from a larger project on lexical inferencing strategies and knowledge sources. The study was carried out in two phases. In Phase 1, data were gathered and analyzed for the relationship between learners’ lexical inferencing strategies and knowledge sources and their lexical inferencing success (Nassaji, 2003b). Phase 2 gathered data about learners’ depth of vocabulary knowledge and analyzed them to discover its relationship with lexical inferencing strategy use and success.

**Participants**

Participants were 21 adult intermediate ESL learners from different language backgrounds, including Chinese, Spanish, Persian, Portuguese, and Arabic. All had recently arrived in Canada and were taking ESL courses to improve their English. They had met Level 4 of the Canadian Language Benchmark in listening and reading (Citizenship and Immigration Canada, 1996).

**Depth of Vocabulary Knowledge Test**

As discussed earlier, depth of vocabulary knowledge is complex, and it is therefore very difficult to assess all the different components that constitute the full range of meanings and meaning relationships of a word. For the same reason, most vocabulary tests in the literature deal with breadth of vocabulary knowledge. In recent years, however, there have been some attempts to develop measures to assess aspects of depth of vocabulary knowledge (Greidanus & Nienhuis, 2001; Paribakht & Wesche, 1993; Read, 1993; Wesche & Paribakht, 1996). For example, in a university ESL context, Paribakht and Wesche (1993, 1996) developed a test called the Vocabulary Knowledge Scale (VKS), which was designed to measure the different levels of lexical knowledge of specific target words learners were learning in a comprehension-based ESL program. The test involves a self-report format in which learners are presented with individual words and asked to indicate their degree of knowledge on a scale of 1 to 5, ranging from no familiarity with the target word to the ability to use it accurately in a sentence.

The VKS test has an easy format that can be used as a practical tool to measure the initial stages of word knowledge for certain words.
However, as Wesche and Praibakh (1996) point out, the test was not designed to “tap sophisticated knowledge of given words or describe the mental lexical networks to which the word belongs” (p. 29). Thus, the measure does not assess the various meaning relationships a word has with other words, though these have been suggested to be an important aspect of depth of vocabulary knowledge (Read, 2000). One measure that attempts to capture these lexical meaning relationships, and which was used in the present study, is the Word-Associate Test (WAT), developed by Read (1999). The WAT purports to measure the learner’s depth of vocabulary knowledge through word associations, that is, the various semantic and collocational relationships that a word has with other words in the language. The test has been found to be closely correlated with L2 reading comprehension ability and has also been shown to have a high degree of internal reliability (Qian, 1999, 2002). The test used in the present study was version 3.1 (Form B) of the WAT. The test is composed of 50 target words, each followed by a list of eight words, four of which are semantically related to the target word while the other four are not. The four related words have been selected to represent three main types of semantic relationship with the target word: paradigmatic relationships (i.e., the word and its associate have similar meanings, such as enable and allow); syntagmatic relationships (i.e., the two words are collocates and co-occur in similar contexts, such as income and tax); and analytic relationships (i.e., the associate represents the meaning of part of the word, such as team and together). The reliability of the test (KR-20), as reported by Read (1993), is 0.92. (Further information about the test and how it was developed can be found in Read, 1993, 1997, 2000.)

The test was administered during a class period. Before learners took the test, they were notified of the general purpose of the study and were informed that their performance on the test would not affect their course outcome. They were instructed to read each of the target words and then circle the four words closely related to the target word. The time allocated to the test was 30 minutes. The split-half reliability of the test in the current study was 0.89.

Lexical Inferencing Strategies

To gather data about learners’ lexical inferencing strategies, the students were presented with a reading passage and asked to read the text for comprehension and to try to infer the meanings of the unknown words. Research suggests that successful inferencing depends heavily on the ability to comprehend the text as a whole and most of the words in it (Hirsh & Nation, 1992; Laufer, 1988; Liu & Nation, 1985). To meet these requirements, several passages, including those used in previous research, were examined. The reading passage selected for use in this study was the one developed by Haastrup (1991) in a study on lexical inferencing with Danish learners of English. The passage contained 374 words, with 10 target words highlighted (see Appendix). The passage had been designed to elicit the use of a variety of inferencing strategies and processes, ranging from those involved in the use of nonlinguistic global comprehension processes to those involved in the use and integration of word-level cues such as prefixes and affixes (Haastrup, 1991). Before being used in the present study, the passage was pilot-tested with a group of ESL students assumed to have similar language proficiency to the participants in the main study. The pilot study revealed that the students had a good overall comprehension of the text (mean of comprehension: 7.6/10). It also showed that the percentage of unknown words in the passage ranged from 4.27% to 2.67%, derived by dividing the total number of the words reported as unknown by the total number of words in the passage and multiplying the results by 100.

An introspective think-aloud technique was used to discover the lexical inferencing strategies learners used; in this procedure, learners are asked to verbalize the content of their thoughts while attempting to infer the meaning of an unknown word from context. Data were collected in individual sessions lasting about 45–60 minutes. In each session, the students were first trained as to how to think aloud: They were given a set of pictures and asked to report what they thought was happening in the pictures. They were then presented with an English text and were asked to practise verbalizing their thinking while trying to infer the meanings of the unfamiliar words they encountered. After this practice session, the students were presented with the text intended for the study and were asked to read the text for comprehension and try to verbalize their thoughts when attempting to infer the meaning of the new words in the text.

Analysis and Results

Identification of Lexical Inferencing Strategies

In order to identify the lexical inferencing strategies used by these learners, all the introspective
think-aloud protocols were initially transcribed and then carefully examined for any observable inferencing strategies. Lexical inferencing strategies were defined as any cognitive or metacognitive activity that the learner turned to for help while trying to derive the meaning of the unknown word from context. Strategies were identified using an inductive procedure involving reading and rereading the protocols. The strategies identified derive mainly from the data and reflect the thinking of the learners participating in the study. Initially, three main categories of strategy types were identified. Following Pressley and Affarbach (1995), these were characterized as identifying, evaluating, and monitoring strategies. Identifying strategies were defined as those that the learners used to identify the meaning of the new word in the text. Learners were found to use different procedures to do so (e.g., repeating the word, repeating the section that contained the word, conducting word analysis, or word–form analogy); each was coded separately. A strategy was coded as word repeating when the learner repeated the word alone; as section repeating when the learner repeated a bigger section, including the clause or the sentence, in which the word had occurred; and as word–form analogy when the learner tried to identify the word meaning based on the sound or form similarity of the word to other words. It was coded as word analysis when the learner attempted to analyze the word into its different components to figure out its meaning.

Evaluating strategies were those that learners used to evaluate and check the accuracy of their initial inferences. Two types of substrategies were identified and coded in this category: self-inquiry, coded when learners questioned their initial inferences, and verifying, coded when learners reread a section of the text to revise or reevaluate their initial inferencing hypotheses or the accuracy of their choices. A strategy was coded as monitoring when the learner showed an awareness of the nature of the problem by making an explicit judgement about the ease or difficulty of the word based on the available cues in the text. While both identifying and evaluating are cognitive strategies, monitoring is a metacognitive strategy.

The reliability of the coding was established by calculating an intercoder agreement on a sample of 20% of the data, selected from every fifth participant and coded by the researcher and a second coder, a colleague of the researcher. The intercoder agreement for that 20% of the data was 89%. Table 1 presents a taxonomy of these strategies, along with their definitions and examples from the transcripts.

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Table 1
Types of Strategies Used

<table>
<thead>
<tr>
<th>1. Identifying</th>
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<tbody>
<tr>
<td>(a) Repeating: The learner repeats any portion of the text, including the word, the phrase, or the sentence in which the word has occurred. Example: “our beliefs waver . . . waver . . . waver . . .” May be . . . waver is something ‘beliefs waver . . .’”</td>
</tr>
<tr>
<td>(b) Word Analysis: The learner attempts to figure out the meaning of the word by analyzing it into various components, such as roots, affixes and suffixes. Example: “and smell of sewage in their noses . . .” sew . . . age . . . should be a kind of smell. But sew is something . . . maybe it is a kind of plant, wood.”</td>
</tr>
<tr>
<td>(c) Word–Form Analogy: The learner attempts to figure out the meaning of the word based on its sound or form similarity with other words. Example: “squalor . . .” may be it is like square . . . square . . . It should be something like that.”</td>
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<table>
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<th>2. Evaluating</th>
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<tr>
<td>(a) Verifying: The learner examines the appropriateness of the inferred meaning by checking it against the wider context. Example: “but when we ourselves become ill, our beliefs waver . . .” our beliefs change . . . change . . . when we become ill our beliefs change . . . yeah.”</td>
</tr>
<tr>
<td>(b) Self-Inquiry: The learner asks himself or herself questions about the word or the meaning he or she has already inferred. Example: “hazards . . .” Should it be pollution according to the sentence? Pollutions? No, no . . . it should not be that . . . it may be something different.”</td>
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</table>

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<tr>
<th>3. Monitoring</th>
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<tbody>
<tr>
<td>(a) Monitoring: The learner shows a conscious awareness of the problem by judging its ease or difficulty. Example: “contract some of the serious and infectious diseases . . .” contract . . . I think contract is make from boss and the staff . . . contract . . . yes . . . this is easy . . . this easy . . . maybe it’s difficult, I am not sure.”</td>
</tr>
</tbody>
</table>

Note. This is a reclassification of the strategies reported in Nassaji (2003).
In order to determine the relationship between depth of vocabulary knowledge and lexical inferencing success, a variety of statistical procedures were employed. As a first step in the analysis, the degree of success in lexical inferencing was determined using a 3-point scale (0 to 2) representing unsuccessful, partially successful, and successful attempts. Successful inferences were defined as those that were semantically, syntactically, and contextually appropriate. Responses that were semantically appropriate but syntactically deviant, or vice versa, were classified as partially successful. In order not to underestimate the learner’s success, if the meaning or the definition provided made sense in the context but, when judged out of context, was not the meaning of the word, the attempt was still classified as partially successful. In cases where the response did not meet any of the above conditions, it was considered unsuccessful. All responses were rated and judged by two independent raters (the researcher and an ESL teacher who is a native English speaker), and an interrater reliability of 94% was established. The total number of responses to all target lexical items was 210 (10 target words × 21 participants). However, during the reading and the retrospective interviews, some participants reported that they knew some of the target words. This reduced the number of responses to 199.

As a second step in the analysis, the participants were divided into two groups: lexically skilled and lexically less skilled students. Grouping was done based on the participants’ percentile rank for the scores they obtained on the depth of vocabulary knowledge test (WAT). A learner’s percentile rank shows how well he or she performs on a test in comparison to others. Those learners whose scores fell at or below the 50th percentile were classified as lexically less skilled (LLS) readers, while those whose scores fell above the 50th percentile were classified as lexically skilled (LS) readers. There were 10 students in the LS group and 11 students in the LLS group. In the next step, the frequencies and percentages of successful, partially successful, and unsuccessful inferences were tallied. These frequencies were calculated for each of the students in each of the two groups of LS and LLS readers.

The results of these analyses are presented in Table 2. As the table shows, of a total of 51 successful inferences, 35 (68.6%) were made by LS readers and only 16 (31.4%) by LLS readers. Of the total number of unsuccessful inferences (111), a great proportion (60.4%) was made by LLS readers, and only 39.6% by LS readers. As for the partially successful inferences, the LLS group seems to have produced comparable numbers of such inferences, although the LS readers tended to produce slightly more. A two-way chi-square test conducted on the proportions of unsuccessful, partially successful, and successful inferences for the two groups of LS and LLS readers showed that the proportions of successful, partially successful, and unsuccessful inferences were significantly different across the two groups, indicating that the degree to which readers were able to infer word meaning successfully was related to their group membership, that is, whether they were lexically skilled or less skilled readers ($\chi^2 = 11.85$, df = 2, $p < .01$).

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>Relationship Between Depth of Vocabulary Knowledge and Inferential Success</th>
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</thead>
<tbody>
<tr>
<td>Word Success</td>
<td>Successful</td>
</tr>
<tr>
<td>Lexically Skilled</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>68.6%</td>
</tr>
<tr>
<td>Lexically Less</td>
<td>16</td>
</tr>
<tr>
<td>Skilled</td>
<td>31.4%</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

proportion and the mean of inferencing success for each strategy across the two groups of LS and LLS readers were calculated. Means of success for each strategy were obtained by dividing the sum of each learner’s scores (on the scale of 0 to 2) by the frequency of the strategy used. The resulting data were then compared across the two groups. T-tests and chi-square statistics were used to determine whether there were any significant differences between the two groups. Table 3 displays the results of these analyses.

As the table shows, LS and LLS students differed significantly in their overall rate of success in inferring word meaning from context. The overall mean of success for the LS group is significantly higher than that for the LLS group (1.11 vs. 0.58, \( p < .000 \)). Lexically skilled and less skilled readers also differed in terms of the use and efficacy of different types of strategies. LLS readers made more frequent use of word repeating than did LS readers (51.9% vs. 48.1%). The mean of success of this strategy, however, was significantly higher for the LS than for the LLS readers (0.85 vs. 0.47). On the other hand, the LS readers made more frequent use of section repeating than did the LLS readers (59.3% vs. 40.7%), and the mean of success for this strategy was also significantly higher for the former than for the latter group (1.20 vs. 0.82). In contrast, LLS readers made more frequent use of word analysis and word–form analogy than did the LS readers (word analysis: 73.1% vs. 26.9%; word–form analogy: 75.0% vs. 25.0%). However, the means of success for the same strategies were higher for the LS than for the LLS (word analysis: 1.28 vs. 0.52; word–form analogy: 0.90 vs. 0.23). This suggests that although LS readers employed local-word-based strategies less frequently than the LLS readers, the LS readers benefited more from the same strategies when they did use them.

Differences were also observed between LS and LLS readers in terms of the frequency of evaluative strategies. LS readers used self-inquiry and verifying more frequently than LLS readers did (self-inquiry: 70.6% vs. 29.4%; verifying: 73% vs. 27%). The means of success for these two strategies were 1.16 and 1.55 for the LS readers and 1.10 and 1.40 for the LLS readers. A comparison of the mean of success across the two groups showed no significant difference for these strategies, suggesting that the two strategies produced similar rates of success in both LS and LLS groups. It is important to note that verifying obtained the highest mean of success in both groups. This result suggests the important contribution of this strategy to successful inferencing.

Successful use of monitoring strategies was also significantly different for the two groups. Although LS and LLS readers used this strategy with equal frequency, the mean of success

### Table 3

<table>
<thead>
<tr>
<th>Type of Strategies</th>
<th>Skill Level</th>
<th>Frequency of Strategy Use</th>
<th>Percent of Strategy Use</th>
<th>Mean of Success</th>
<th>SD</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identifying</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Word</td>
<td>LS</td>
<td>90</td>
<td>48.1%</td>
<td>0.85</td>
<td>0.89</td>
<td>.002</td>
</tr>
<tr>
<td>Repeating</td>
<td>LLS</td>
<td>97</td>
<td>51.9%</td>
<td>0.47</td>
<td>0.75</td>
<td>.028</td>
</tr>
<tr>
<td>Section</td>
<td>LS</td>
<td>67</td>
<td>59.3%</td>
<td>1.20</td>
<td>0.89</td>
<td>.06</td>
</tr>
<tr>
<td>Repeating</td>
<td>LLS</td>
<td>46</td>
<td>40.7%</td>
<td>0.82</td>
<td>0.90</td>
<td>.008</td>
</tr>
<tr>
<td>Word Analysis</td>
<td>LS</td>
<td>7</td>
<td>26.9%</td>
<td>1.28</td>
<td>0.95</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>19</td>
<td>73.1%</td>
<td>0.52</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Word–Form Analogy</td>
<td>LS</td>
<td>10</td>
<td>25.0%</td>
<td>0.90</td>
<td>0.87</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>30</td>
<td>75.0%</td>
<td>0.23</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>Evaluating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-Inquiry</td>
<td>LS</td>
<td>24</td>
<td>70.6%</td>
<td>1.16</td>
<td>0.96</td>
<td>.85</td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>10</td>
<td>29.4%</td>
<td>1.10</td>
<td>0.99</td>
<td></td>
</tr>
<tr>
<td>Verifying</td>
<td>LS</td>
<td>27</td>
<td>73.0%</td>
<td>1.55</td>
<td>0.75</td>
<td>.59</td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>10</td>
<td>27.0%</td>
<td>1.40</td>
<td>0.84</td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monitoring</td>
<td>LS</td>
<td>16</td>
<td>47.1%</td>
<td>1.43</td>
<td>0.81</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>18</td>
<td>52.9%</td>
<td>1.50</td>
<td>0.78</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>LS</td>
<td>241</td>
<td>51.2%</td>
<td>1.11</td>
<td>0.90</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>LLS</td>
<td>230</td>
<td>48.8%</td>
<td>0.58</td>
<td>0.82</td>
<td></td>
</tr>
</tbody>
</table>

for monitoring is significantly higher for the former than for the latter group. This finding suggests that the LS readers benefited more from monitoring strategies than the LLS readers did.

As a final step in the analysis, a two-way chi-square test was conducted on the proportions of strategy types and the two groups (LS and LLS readers). This analysis produced a significant chi-square value ($\chi^2 = 33.157, df = 6, p < .000$), suggesting that the degree to which learners used different strategies was significantly related to their degree of lexical proficiency.

The above findings suggest an important link between learners’ depth of vocabulary knowledge and their use of lexical inferencing strategies. In particular, they show that lexically skilled and less skilled readers differed not only in the type of strategies used, but also in how effectively they use them. The reason for this advantage for the LS readers may be partly related to their greater depth as well as breadth of word knowledge: Their richer lexical knowledge may make them better able to make use of the potential cues available in the text and context. The following two excerpts illustrate the inferencing attempts made by LS and LLS students:

**LLS:** ‘... and the smell of sewage in their nose...’ in their nose... their toes...’ ‘the toes and the smell of sewage in their nose,’ ‘their toes’... umm... because it is in their nose, I think... ‘between their toes’ I am not sure... because something in their nose their... mmm... is... mmm... maybe it’s their... it’s their... I’m not sure. ‘the smell of sewage...’ it’s the smell... the sewage it is something... there is some smell... may be sew... I’m not sure...

**LS:** ‘Sewage in their nose...’ ‘smell of their sewage in their nose...’ ‘have dust between their toes and the smell of sewage in their nose...’ I think, there are a lot of dirty things around the city and that those things are making smells, and the smell goes to their noses, so sewage are things like dirty things, garbage, like, according to this... and the smell of the sewage in their nose.’ Yes.

In the first example, the student’s efforts seem to be mostly concentrated on the random repetition of certain words or parts of the text. The learner does not seem to be focusing on the meaning in the text, since the learner’s repetitions pick up on inappropriate meaning boundaries in the text (e.g., ‘in their nose... their toes...’ ‘the toes and the smell of sewage in their nose,’ ‘their toes...’).

In the second example, the student seems to be more focused. There are fewer random repetitions, and, when repeating, the student repeats a bigger meaningful section of the text that includes the word and the context in which the word has occurred. The student seems to have made better use of the information available in the text than the previous student. This is evident from the semantic connections the student has established between the different sections of the text and from the conclusion that the word *sewage* should be related to dirty things because there are dirty things around the city. Finally, after inferring the meaning of the word, the student evaluates it by rereading the same portion of the text and trying to verify the accuracy of that inferencing attempt.

*Contributions of Depth of Vocabulary Knowledge and Degree of Lexical Inferencing Strategy Use to Inferential Success*

The analyses described so far focused on the difference between LS and LLS readers in their use of different types of lexical inferencing strategies. The results show that LS and LLS readers indeed differed significantly, both in terms of the type of strategies they used and in terms of how effectively they used them. The next series of analyses examined the collective and the independent contributions to inferential success of depth of vocabulary knowledge and degree of lexical inferencing attempts. To this end, a series of multiple regression analyses was conducted in which inferential success was used as a dependent (criterion) variable and the learner’s degree of lexical inferencing strategy use and depth of vocabulary knowledge were used as independent (predictor) variables. Inferential success represented each learner’s total scores of success for the 10 target words; depth of vocabulary knowledge consisted of the learners’ scores on the depth of vocabulary knowledge test; and degree of strategy use consisted of composite scores of the various types of strategies used. Composite scores were calculated from the sum of standardized (z) scores of the frequency of each strategy type used. Z-scores were used because the raw frequency scores do not indicate how the strategy use of one student compares with that of another student who has used different types and degrees of strategies.

Separate forced-entry, hierarchical, multiple regressions were performed in which each of the predictor variables was entered into the regression equation in different orders. To determine the contribution of any of the independent variables over and above the contribution of the...
other, that variable was entered into the regression model after the other one. Any variance remaining for the second variable in the equation was then considered the unique variance of that variable, not being accounted for by the variables already in the equation (Kerlinger & Pedhazur, 1973).

The results of the hierarchical multiple regression analyses are presented in Table 4. The first section of the table (marked A) displays the results of the regressions where degree of lexical inferencing strategy use was entered first into the equation, followed by depth of vocabulary knowledge. These analyses examined whether depth of vocabulary knowledge could explain any variance in inferential success after the variance attributable to lexical inferencing attempts was partialled out. The second section (marked B) displays the results where degree of lexical inferencing strategy use was entered after depth of vocabulary knowledge. These analyses examined whether degree of lexical inferencing attempts could explain any significant proportion of variance after the variance attributable to depth of vocabulary knowledge was partialled out. The column labelled 'R² change' in the table shows the magnitude of the contribution of each variable at the point where that variable was entered into the analysis.

As Table 4 shows, when entered on the first step, lexical inferencing strategy use accounted for 20% of the variance (p < .05) in lexical inferencing success. Entered on the second step, overall depth of vocabulary knowledge accounted for an additional and significant proportion of variance in lexical inferencing success (17%, p < .05). In the next series of analyses, depth of vocabulary knowledge, entered on the first step, explained a significant proportion of variance in inferential success (33%, p < .01). Entered on the second step, degree of lexical inferencing strategy accounted for only 4% of variance, which was not significant.

The results of these analyses suggest that of the two predictor variables, learners’ depth of vocabulary knowledge was a much stronger predictor of lexical inferencing success than degree of strategy use. Thus, although there is a relationship between the use of lexical inferencing strategy and success, the effectiveness of lexical inferencing attempts is significantly mediated by the learner’s depth of vocabulary knowledge.

**DISCUSSION AND CONCLUSIONS**

This study examined the relationship between ESL learners’ depth of vocabulary knowledge and their ability to derive word meaning from context. In particular, it examined how learners’ depth of vocabulary knowledge relates to the degree and type of lexical inferencing strategies they use and how this relationship affects learners’ success in inferring word meaning from context. Results indicate a significant link between depth of vocabulary knowledge and the degree and type of lexical inferencing strategy use. They show that (a) those who had stronger depth of vocabulary knowledge used certain types of lexical inferencing strategies more frequently than those who had weaker depth of vocabulary knowledge; (b) those who had stronger depth of vocabulary knowledge used certain types of lexical inferencing strategies more effectively than those who had weaker depth of vocabulary knowledge; and (c) depth of vocabulary knowledge made a significant contribution to inferential success, over and above the contribution made by the learner’s degree of inferencing strategy use. These findings add to and confirm the literature in both L1 and L2 learning concerning the central role of vocabulary knowledge in lexical inferencing, and support the hypothesis that lexical inferencing is a meaning construction process that depends heavily on the richness of the learner’s semantic and conceptual system (de Bot et al., 1997; Fukkink, Blok, & de Glopper, 2001). They are also consistent with the theoretical view that the ability to make use of contextual clues in inferencing depends, to a large extent, on having an adequate knowledge base in place, in this case a threshold of vocabulary knowledge (Coady, Magoto, Hubbard, Graney, & Mokhtari, 1993; Laufer, 1988, 1992, 1996; Nation, 1993).

It is usually assumed that a major factor affecting lexical inferencing is the ability to make
effective use of contextual clues (Dubin & Olsh
tain, 1993; Haastrup, 1991; Huckin & Bloch, 1993;
Nagy, 1997; Nagy, Anderson, & Herman, 1987;
Nagy & Scott, 2000; Parry, 1993). However, there is
conflicting evidence in the literature as to whether
students who have stronger linguistic skills can
benefit more from the use of context than those
who have weaker linguistic skills (Frantzen, 2003).
Some studies have found that no matter what level
of language proficiency learners have, context
may not help them much in successfully inferring
the meaning of unknown words (Bensoussan &
Lauf e, 1984). Other studies suggest that learners’
level of language proficiency plays a major role in
using context effectively (Haastrup, 1991; Lauf e
for example, found that those students who were
linguistically more proficient made many more
correct lexical guesses (74%) than less proficient
learners, who made only 54% correct guesses. The
present study’s findings are consistent with those
of Haastrup (1991), Laufer and Sim (1985), and
Morrison (1996): in this study, of a total of 51 suc
cessful inferences, 35 (68.6%) were made by the
LLS readers and only 16 (31.4%) were made by LS
readers.

The analysis also showed a difference in the
types of strategies used by the LS and LLS stu-
dents. The students who were more proficient
in terms of depth of vocabulary knowledge made
more frequent and effective use of evaluative and
context-based strategies, including verifying, self-
inquiry, and section repeating, than those who
were lexically less skilled. On the other hand,
LLS students made more use of local-word-based
strategies such as analysis, word repeating, and
word-form analogy, though the LS students ben
efited more from these same strategies when they
did use them. These findings may explain the dis
crepancy, in previous research, in results pertain
ing to the relative importance of local-word-based
strategies. For example, Huckin and Bloch (1993)
report that one of the major and successful strat
ty types their learners used was analytic word-
clue strategies. Other studies (Frantzen, 2003;
Haynes, 1993; Morrison, 1996; Parry, 1993, 1997)
did not report such an advantage for local-word-
based strategies. One factor that may explain this
difference could be the learner’s depth of vo
cabulary knowledge. It is possible that learners
who participated in Huckin and Bloch’s study, be
cause they were graduate students studying at an
English-speaking university, had a stronger depth
of vocabulary knowledge and, hence, had a better
knowledge of the different components that make
up the words. This enhanced knowledge of word

components could have increased their ability to
use and benefit from word-based strategies.

Another finding of this research has to do with
the relative contributions of depth of vocabulary
knowledge and degree of lexical inferencing strat
ey use. Hierarchical multiple regression analyses
showed that while the degree of lexical inferencing
attempts explained some proportion of the
variance in lexical inferencing success when en-
tered first in the equation, its contribution be
came insignificant when the contribution related
to the depth of vocabulary knowledge was par
tialled out. This finding, as well as those reported
above relating to the difference between LS and
LLS readers in type of strategy use, suggests that
while lexical inferencing strategy plays a role in
lexical inferencing success, the degree and effec
tiveness of these strategic attempts are heavily me
diated by the learner’s depth of lexical and seman
tic knowledge.

Overall, the above findings seem to support ap
proaches to lexical inferencing that emphasize
the richness of the learner’s semantic and con
ceptual systems. Thus, they are consistent with
the view that inferring the meanings of unfamil
iar words from context depends on how success
fully learners construct appropriate semantic fea
ures for an unknown word (de Bot et al., 1997).
In their study, de Bot et al. (1997) found ev
dence for the use of multiple sources of informa
tion during lexical inferencing. They found that
learners frequently appealed to their knowledge
of syntax, morphology, word derivation, and asso
ciation. These knowledge sources are important
components of depth of lexical knowledge (Na
tion, 1990; Richards, 1976). Thus, it can be as
sumed that those learners who possess a deeper
lexical knowledge have better access to these
knowledge sources and, hence, can construct a
more accurate semantic representation of the un
known word during lexical inferencing than those
who do not.

IMPLICATIONS AND DIRECTIONS
FOR FURTHER RESEARCH
The present study supports the findings of pre
vious research that L2 learners need good vo
cabulary knowledge to be able to successfully de
rive word meanings from context (Coady et al.,
1993; Haynes & Baker, 1993; Laufer, 1997; Na
tion, 1990, 2001). Strong evidence exists in the
field of L1 vocabulary research regarding the ef
fectiveness of learning vocabulary from context.
Research in L2 contexts, however, does not pro
de such strong support for lexical inferencing

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(Bensoussan & Laufer, 1984; Haastrup, 1991). Based on the findings of this study, it could be argued that the difference in effectiveness of lexical inferencing between L2 and L1 (native) readers may also be related to the difference between the two in terms of their depth of vocabulary knowledge. L1 readers are different from L2 readers not only in terms of their breadth of vocabulary knowledge (Nation, 2001) but also in terms of the totality of lexical representation for each lexical entry in their lexicon. The different types of syntactic, semantic, and morphological information forming a lexical representation of a lexical entry in a learner’s L1 are more strongly and highly integrated than those in the L2 (Jiang, 2000). This provides L1 learners with a rich lexical knowledge network that can be drawn upon, during lexical inferencing, to integrate information across and within sentences and to generate accurate syntactic and semantic inferences about words. Thus, in order to benefit from lexical inferencing, L2 learners must also have such a robust lexical knowledge base in place (Coady et al., 1993; Hirsh & Nation, 1992; Laufer, 1988, 1992, 1996; Nation, 1999). One way of achieving this goal would be to establish a thorough vocabulary learning program that integrates extensive exposure to language and learning vocabulary from context with direct and systematic vocabulary instruction, particularly in the early stages of L2 acquisition (see Paribakht & Wesche, 1997; Zimmerman, 1997).

Another related implication is for strategy training. In this study LLS readers rarely used context-based evaluative strategies, suggesting that this strategy should be emphasized in teaching lexical inferencing strategies. However, one of the key issues in the literature on strategy training is whether learners can be trained to use lexical inferencing strategies effectively. While some studies have found a positive effect for strategy training on reading comprehension and inferencing ability (e.g., Fraser, 1999; Kern, 1989), others have failed to produce such strong effects (e.g., Barnett, 1988). The present study found that the type and effectiveness of lexical inferencing strategies learners use are significantly related to the learner’s depth of vocabulary knowledge. Therefore, the role of this factor must be considered in lexical inferencing strategy use and training. Clearly, further research is needed to investigate empirically the role of this factor in strategy training. Previous studies have suggested that an important factor affecting success in lexical inferencing strategy use is the learner’s language proficiency (Kern, 1989). However, language proficiency is multifaceted, and it is possible that some dimensions of that knowledge may play a greater role than others in helping the learner to infer the meaning of an unfamiliar word from context. Thus, further research is needed to investigate the relationship between the different components of language proficiency and lexical inferencing; for example, the role of size of vocabulary knowledge versus depth of vocabulary knowledge in deriving word meaning from context. Size and depth of vocabulary knowledge have been shown to differentially affect L2 reading comprehension (Qian, 1999). Are these variables also different in their contributions to lexical inferencing strategy use and success? Further research is also needed to address the role of other dimensions of linguistic knowledge, such as grammatical knowledge, morphological knowledge, and discourse knowledge, in L2 lexical inferencing.

Another point is in order. Research has suggested that the kinds of lexical inferencing strategies L2 learners use depend heavily on the nature of the word as well as the text containing the word (Paribakht & Wesche, 1999). Therefore, before drawing any conclusions about the relative importance of the factors affecting lexical inferencing, further research must examine these processes in different contexts and with different types of texts and words.

ACKNOWLEDGMENTS

I would like to thank John Read, who provided me with the Word-Associate Test used in the study. I would also like to thank the anonymous reviewers and the editor of the themed-based issue of the Canadian Modern Language Review, Patricia Raymond, for their careful reading and very helpful comments.

NOTE

1 The test was supplied to the author by its developer, John Read, of Victoria University of Wellington, New Zealand.

REFERENCES


APPENDIX

Health in the Rich World and in the Poor

An American journalist, Dorothy Thompson, criticises the rich world’s health programmes in the poor world. She describes her trip to Africa where she got food poisoning and her friend malaria: “The town is very dirty. All the people are hot, have dust between their toes and the smell of sewage in their noses. We both fell ill, and at ten o’clock in the morning I got frightened and took my friend to the only private hospital in town, where you have to pay. After being treated by a doctor, we caught the next aeroplane home.

“Now, I believe that the money of the World Health Organisation (WHO) should be spent on bringing health to all people of the world and not on expensive doctors and hospitals for the few who can pay. But when we ourselves become ill, our beliefs waver. After we came back to the States we thought a lot about our reaction to this sudden meeting with health care in a poor country. When assessing modern medicine, we often forget that without more money for food and clean water to drink, it is impossible to fight the diseases that are caused by infections.

“Doctors seem to overlook this fact. They ought to spend much time thinking about why they themselves do not contract some of the serious and infectious diseases that so many of their patients die from. They do not realize that an illness must find a body that is weak either because of stress or hunger. People are killed by the conditions they live under, the lack of food and money and the squalor. Doctors should analyze why people become ill rather than take such a keen interest in the curative effect of medicine.

“In the rich world many diseases are caused by affluence. The causes of heart diseases, for instance, are far from being mysterious and unfathomable—they are as well known as the causes of tuberculosis. Other diseases are due to hazards in the natural conditions in which we live. Imagine the typical American worker on his death-bed: every cell permeated with such things as chemicals and radio-active materials. Such symptoms are true signs of an unhealthy world.”
