INFLUENCES ON INFERENCES:
THE ROLES OF L1 TRANSFER AND L2 PROFICIENCY ON L2 LEXICAL INFERENCE

A RESEARCH PAPER
SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
MASTERS OF SCIENCE

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JULY 2013
The research has revealed that within lexical inference there are a variety of strategies used by readers to infer the meanings of unknown words. Researchers have investigated the influence of many factors on patterns of strategy use and success. Two such factors are L1 transfer and L2 proficiency.

The current study investigates the influence of L1 transfer as well as L2 proficiency on both native Arabic and native Mandarin speakers. The study utilizes previous research in the design of materials of protocols. Six participants completed a think-aloud lexical inference task followed by a reading strategy questionnaire. There were three Arabic and three Mandarin native speakers represented, and within each L1 group, three levels of reading proficiency were represented.

The results for each think-aloud and questionnaire were coded and analyzed by the individual respondent then analyzed according to both respondents’ L1 and proficiency. The results reveal that accuracy of inferencing increases as proficiency increases. While the findings are participant specific, there were patterns found based on the following variables: L1 transfer, L2 proficiency and area of academic study.
Acknowledgements

I would like to thank all of the participants and who contributed to this study. Without their contributions, this study would not have been possible.

I would also like to acknowledge the patience and assistance I have received from my friends and family throughout the process of designing and implementing my Master’s research project. Throughout my entire graduate career, their support and guidance has been an invaluable blessing to me.

Finally, I would like to offer my thanks to Dr. Megumi Hamada. She has been a teacher, advisor and mentor to me over the last two years. With her guidance, I have matured as a researcher, educator, and writer. Her work in the areas of SLA and applied linguistics has shown me of what it means to excel in this field. She is the type of professor and researcher that I aspire to become one day, and I am very grateful for all that she has taught me.
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Introduction

Vocabulary is an essential component of all areas of language learning. The learning of new vocabulary is incorporated in both learning a native language (from here on referred to as a first language) as well as learning a language other than your native language (from here on referred to as a second language). Research investigating both first and second language vocabulary learning seeks to better understand the vast development of word and meaning associations. As people grow older, learning new words involves multiple processes and strategies as people attempt to expand their lexicon (Nation, 1990). Cunningham and O’Donnell (2012) reported on what researchers found to be the average number of words students in grade school know at a given age. Based on that research, Cunningham and O’Donnell (2012) report that “students who excel academically are likely mastering an average of almost 100 words a week for 12 years.”

Research has shown that written works include more rare words than spoken means of communication (Hayes & Ahrens, 1988). Within the subject area of reading, there are not only more variety of words used, but also there are many components to the complex process to take into consideration: writing systems, word-part forms (morphology), grammar conventions (syntax), and background knowledge. Not only do readers need to know the vocabulary in the readings, but they also need to be able to decipher the writing system and process the information in order to connect meaning to the words in the passage.
When a person learns a second language, they must learn a new set of meanings associated with concepts and words, also known as a vocabulary. The elements of these words that must be mastered include the following: Educators and researchers into both first and second language studies know vocabulary’s crucial role in language learning. The best method for learning vocabulary in a second language has been debated by many researchers, and theories have changed a great deal over time. Currently, research reveals that best practices involve a variety of approaches to vocabulary acquisition (Grabe, 2009). This variety includes learning words through memorizing lists, exposure to the words, vocabulary games, and many other instruction strategies. One vocabulary strategy is determining the meanings of words in a passage from clues in the text.

No matter how extensive their knowledge of vocabulary and lexicon may be, all readers at one point or another have come across a nonlexiation that immediately causes them to pause and re-read the word or phrase they do not know. Should a dictionary not be available, the reader may dissect the nonlexiation and use their knowledge of morphology (word parts) and grammar to determine word class or suffix meanings (Nation, 1990). For instance, the term “nonlexiation” contains “non-” which is a negation word part (hereafter the concept of a “word part” will be described as a morpheme), and “-tion” which signals the grammatical category of noun. The reader might also notice that there is an ‘a’ before the word, also signaling this word is a noun. If the reader is familiar with linguistics, they may connect the “lexi-” morpheme with other words that are similar such as lexical or lexeme, both dealing with words with meaning. A person may piece together these parts of “nonlexiation” to infer that it refers to a type of word with no meaning. The reader might even check their diagnosis with the context of the sentence meaning and find that “word or phrase they do not know” matches their definition (Schmitt, 2000).
The meaning of the pseudoword (made-up word) “nonlexiation” could be given meaning through the use of many different cues and methods of analysis. The act of forming connections between a meaning that is known and structures that are unknown is a component of inferencing (Pulido, 2007). Inferring meaning when reading involves engaging multiple strategies and clues from the text. Lexical inference is focusing on the unknown words (or lexical items) and inferring their meaning through clues given in and out of the text (Nation, 1990; Schmitt, 2000). In fact, research has shown that readers that are more proficient utilize multiple strategies while inferring the meaning of an unknown word (Hamada & Park, 2011; Kojic-Sabo & Lightbrow, 1999; Nassaji, 2003). Lexical inference can be categorized as both a vocabulary learning strategy as well as a reading strategy.

Just as illustrated with “nonlexiation,” there are many ways to dissect a given word and piece together meaning. While the vocabulary learning component of this dissection is crucial to language learning, the current study will focus on the act of lexical inference while reading. The psychological and mental processing involved in this complex act will be the focus of this study. Studies of this nature attempt to bridge the gap between the scientific linguistic research and the pedagogical application of that research. While it is important to understand how the thought process works, it is just as important to be able to use that information for the betterment of the community.

Understanding the ways language learners infer vocabulary will lead us to recommend instructional strategies to assist learners. Contributing to the education of language learners in the areas of reading and vocabulary is the core goal of this study. Through a clearer and more thorough understanding of lexical inference the vocabulary learning process might be enhanced,
and as stated earlier, vocabulary learning is a crucial component of all areas of language learning.
Review of the Literature

Lexical Inferencing

Inference. To better understand the process of lexical inferencing, it is important to fully understand both the concepts of inference as well as lexical unit. The process of inference involves more than simply guessing the meanings of unknown words. Reading is enriched through the use of inferencing strategies, and to say that there is a single reading strategy termed “inference” limits the conceptual framework of the inference process (Grabe, 2009; Lorch & O’Brien, 1995; Rayner et al, 2012). Despite this limitation, it is generally understood by those in the fields of reading research and psycholinguistics that the idea of inferencing is accepted as a crucial reading comprehension strategy. The term reading strategy here relates to a technique or mental tool that readers can use to enhance their reading abilities or compensate for some reading skill they may lack. A reading skill is a natural or developed ability to process written text as well as comprehend the meaning behind the text. It is important to understand that strategies are tools, and skills are abilities because the two terms are often misinterpreted in reading research texts (Grabe, 2009). Inference is a reading strategy that involves

Inference is labeled in reading research as a reading strategy. This means it is understood to be a mental tool that readers use to make connections within a text as well as make connections between the text and knowledge outside the text to better comprehend what they are reading. In many ways you might think of an inference as an educated guess. A person will take what they know from their own knowledge and experiences as well as the information presented
to them and make connections to guess at the intended meaning or message. The process of inferencing is taking any statement and connecting meaning to it outside of what is on the surface. For example, the following statement could be inferred multiple ways:

1) The woman tripped on the ice outside the door.

The woman may be injured or embarrassed. The weather may be cold to the point that the ground is frozen. Perhaps, the inference involves the fact that this event took place in the past and most likely during the winter. Regardless of the inference made, all of the statements are inferences: using cues to decipher the meaning of something that is not explicitly obvious.

The current research investigation is examining the process of inference as it is applied to techniques in processing lexical units (i.e. words).

**Lexical Unit.** One might assume that the term “word” would be far more convenient than the term “lexical unit” to describe the basic language unit that holds semantic meaning (semantic here refers to the field of linguistics focused on sentence and word meaning), but the term “word” actually is quite elusive. According to Cruse (2011), a word follows the rules that it first can be moved about in a sentence, and second that it cannot be interrupted or have its parts reordered. However, the lexical unit is defined as first “the smallest unit whose occurrence is not constrained by co-text.” and second a unit that has “holistic meaning.” From another perspective, Schmitt (2000) defines the term as “an item that functions as a single meaning unit, regardless of the number of words it contains.” While words can be represented in a mirrad of methods, by its syntactic role and morphological representation, a lexical unit is restricted to a given meaning and can appear in multiple syntactic roles (e.g. “walks,” “walked,” and “walking” are all separate words that contain the lexical unit “walk”).
Lexical units are limited in a way, by being free morphemes that hold meaning. It might sound strange to consider something “free” as being limited, but the idea is that the lexical unit is limited to one meaning. A word is bound by grammatical functions and contextual occurrence. The word “cat” for instance is a single lexical unit that holds the same meaning as the base form of cats; however, these are two separate words. For this reason the concept of “lexical unit” will be used in discussions on the processes involved in inferring the meaning of unknown morphemes in a text (Cruse, 1986; 2011). By using the term “lexical unit” the study will be referring to the written form that holds a distinct meaning that is free from context and grammatical constraints.

**Lexical inferencing** is a term that has been used in the last few decades to describe the process of guessing the meaning of words while reading. Considering the two parts of the definition for lexical unit, the lexical inference process involves inferring the second component of lexical unit (meaning) based on the representation of the first (a unit unrestrained by co-text) (Cruse, 2011; Grabe, 2009; Lorch & O’Brien, 1995; Schmitt 2000). Lexical inference often falls under the category of incidental word learning. Research has investigated the difference between incidental word learning and intentional word learning. Incidental word learning involves learning the meaning of a word through exposure to the language. Intentional word learning, on the other hand, involves explicitly being told or intentionally investigating the meaning of a given word (Cunningham & O’Donnell, 2012; Grabe, 2009; Rayner, et al. 2012).

Studies on lexical inference as a vocabulary learning strategy often compare the recall accuracy of inferring the meaning of contextualized words (i.e. lexical inference) with other strategies such as repetition and dictionary use (Cain, 2007; Cain, Lemmon & Oakhill, 2004; Laufer, 1997; Lawson & Hogben, 1996; Parry, 1997). Other studies investigate the ways
students increase their lexicon through the use of strategies such as lexical inference (Coady, 1997; Nagy, Herman & Anderson, 1985). While these methods of analyzing lexical inference are insightful, the current study will focus on lexical inference as a reading strategy. More specifically the focus of this study is on lexical inference as a reading strategy used when reading in a second language. Given the fact that learning vocabulary in a second language (henceforth referred to as L2) is different than learning vocabulary in a native language (henceforth referred to as L1), it should come as no surprise that the use of lexical inference in a L2 differs from its use in a L1.

Within lexical inference, it has been shown that, just as with vocabulary and reading strategies, a variety of strategies and approaches are beneficial to effectively infer the meanings of highlighted words (Hu & Nassaji, 2011; Nassaji, 2003; 2004; Pulido, 2007). Studies on lexical inference seek to determine many aspects of lexical inference. For instance, studies have examined the common types of strategies that readers use, the retention of inferred meaning of the words, the grammatical complexity and components of the passage and words, as well as the topic familiarity effects (Hu & Nassaji, 2011; Kaivanpanah, 2008; Nassaji, 2003; Pulido, 2007). Lexical inference involves more than simply making a random guess at meanings. The lexical unit and the surrounding context are analyzed and cues are extracted (e.g. the meaning of the surrounding sentence, the theme of the passage, the suffix meaning, similarity of the word to other words, etc.). The cues are integrated in a complex process of creating meaning that connects with the unknown lexical unit. Psycholinguistics explores these different cognitive processes that form complex layers that interact in the mind of the reader.

Lexical inference can be subdivided into different strategies based on the aspects of the passage or word a reader uses to determine meaning (Nation, 1990). Both the educational focus
of particular cultures as well as linguistic features of a written language influence the strategies used. When a reader attempts to infer the meanings of words in a second language they will tend to use multiple knowledge sources. The strategies that are used most often, are those that focus on integrating such elements as grammatical knowledge of a given word, the word parts of a lexical unit, the context surrounding an inferred word, as well as background knowledge learners bring to the reading passage. A few studies focus on the types of skills and strategies readers use, the accuracy of different skills and strategies in inferring lexical meaning, whether the meaning can be retained over a long period of time, comparisons of lexical inferencing with other reading processes, and metacognition in relation to lexical inference (Frantzen, 2003; Grabe, 2009; Haastrup, 1991; Hamada & Park, 2011; Hu & Nassaji, 2011; Nassaji, 2003).

The focus of the present study is on the strategies and skills that L2 English readers use while reading. The materials have been designed to elicit metacognition (i.e. the process of consciously considering what you are thinking). The strategies investigated will be based on strategies highlighted and described in previous studies. In the next section, the strategies used for L2 lexical inference will first be generally described in relation to L2 reading strategies before being applied to specific components related to this particular study.

**Lexical Inference as a Reading Strategy**

As noted earlier, reading strategies typically are used to make-up for some missing reading skill that does not come naturally or easily to the reader. Grabe distinguished skills and strategies with the following statement: “Strategies are cognitive processes that are open to conscious reflection but that may be on their way to becoming skills” (2009, p. 221). This description reveals that strategies are processes or tools used to enhance reading skills. Research in the area of reading strategies has sought to determine which strategies are most effective with
the intention of making applicable suggestions for teaching and language learning. These attempts are motivated by facts found in research that vocabulary knowledge is directly related to reading comprehension. If a reader is not able to understand a given word, they must “guess” the meaning, and it is this process of guessing or inferencing that researchers attempt to describe in order to provide guidance for learners (Grabe, 2009; Nation & Coady, 1988).

Research has shown that there are multiple factors that influence the use of reading strategies, in particular lexical inference strategies. Factors in reading research often involve the different elements that can affect the goal of reading effectively (e.g. the type of text, complexity of text, the reader’s age, level of reading skills, reader’s background, etc). The effectiveness of the strategies is also a major area of research that focuses on a number of factors (Grace, 1998; Hamada & Koda, 2010; Kavianpanah, 2008; Pulido, 2007).

A few examples of the types of factors researchers investigate in lexical inference strategies used by ESL students are grammatical knowledge, topic familiarity, vocabulary knowledge, L1 transfer, L2 proficiency, learning styles, and use of context. Studies on the influence of grammatical knowledge often involve comparing the effects of inferring words in syntactically (syntax referring to sentence forms) and rhetorically (rhetoric referring to paragraph or passage structures) complex texts as well as the effects of having knowledge of the language’s morphology or word forms and structures (Feng & Morkhtari, 1998; Kaivanpanah, 2008). Grammatical knowledge will serve to play a key role in the current study; therefore, it is important to understand that the form a lexical unit takes in a syntactic construction plays a role in the inference of that unit (Kaivanpanah, 2008).

Not only is the complexity of the syntactic structure and passage studied, but the familiarity of the topic as well (Pulido, 2003). Studies on vocabulary knowledge generally focus
on whether inferring words from context enhances a learner’s lexicon (all of the vocabulary a person knows) as well as whether the size of a learner’s lexicon affects the inference process (Boggards, 2011; Salsbury, Crossley & McNamara, 2011).

Studies on L1 transfer often focus on issues of transferring knowledge of orthography (writing systems) and reading strategies that are common in the learner’s L1. Studied on L1 transfer also often investigate the effects of L1 proficiency on L2 reading and the actual use of L1 while reading in the L2 (Hamada & Koda, 2010; Parkibakht, 2005; Seng & Hashim, 2006; Tang, 1997). The topic of L1 transfer will be covered in depth further on in the literature review.

There have been numerous studies on the effects of L2 proficiency on reading, which will be elaborated upon later (Pulido, 2003; Riazi & Babaei, 2008). A recent study was also conducted on the effects of learning style on lexical inference strategy use (Shen, 2010). The largest area of research, however, has been on the use of context while inferring the meanings of lexical items. Context in these studies refers to the words and sentences surrounding the inferred word as well as the overall meaning of the text (Frantzen, 2003; Kieffer & Lesaux, 2012; Kuhn & Stahl, 1998; Lawson & Hogben, 1996; Nagy, Herman & Anderson, 1985).

In early research on lexical inference strategies, Nation and Coady designed steps to effectively infer the meaning of unknown words. At that time, Nation and Coady argued that it was important that learners go through all of the steps in order to effectively infer the meanings of words. According to Nation and Coady, “Studies of incorrect guessing show the importance of getting learners to delay making use of word clues until they have made full use of the available context clues” (1988, p. 108). In recent research, it has been found that while it is not necessary to go through a certain order of prescribed strategies, it is advantageous to use more than one strategy at a time. For instance, researchers have found that the more proficient, skilled readers
typically use multiple reading strategies and use the same strategies effectively (Hamada & Park, 2011; Kojic-Sabo & Lightbrown, 1999; Nassaji, 2003). This practice of using multiple strategies is particularly helpful for the retention (i.e. remembrance) of the vocabulary words learned (Hu & Nassaji, 2011; Mondria, 2003)

**Metacognition.** One aspect of inferring unknown words that has been argued to be a lexical inference strategy is metacognition. Metacognition, in fact, is a term used to describe one of two categories of reading processes: cognitive and metacognitive. Cognitive processes are those that occur without conscious thought while metacognitive processes occur as a reader consciously considers what they are thinking and what areas of a text they are focused on (Grabe, 2009; Yang, 2006).

Many studies in the area of lexical inference utilize metacognitive processes and use methodologies such as think-alouds that elicit metacognition to determine the types of lexical inference strategies that readers use as they are reading. A think-aloud is a task in which a reader will read and verbalize their thoughts as they are reading. In Arabic alone, studies that have investigated the use of metacognitive processes in general have found that the use of metacognition increases as proficiency increases (Malcolm, 2009). Research has also investigated the use of metacognitive processes in relation to differences between reading in an L1 and an L2 (Alsheikh, 2011). Research into metacognition is not limited to Arabic, but has been extensively researched in multiple languages. Metacognitive processes are the focus of the present investigation. The research background and material creation is based on previous research that utilizes metacognition. The research considers another categorization of lexical inference strategies known as top-down vs. bottom-up strategies in the context L2 reading. The difference between these two categories of strategies will be elaborated on in the next section.
**Top-Down vs. Bottom-Up.** When considering all of the types of metacognitive and cognitive strategies available to readers, there is often a distinction between lexical inference strategies made between those that are bottom-up and top-down. In general, there are three common models of reading that are emphasized in reading instruction: top-down, bottom-up, and interactive (Grabe, 2009). Top-down models operate based on the philosophy that readers process only the information they are given and process it all very quickly. Within lexical inference, top-down strategies are often those that consider the sources surrounding a word and the general gist of a passage. Bottom-up models contradict this view by claiming that people are constantly referencing their own personal experience and background knowledge as they read and that they read very slowly. Within lexical inference, bottom-up strategies are those that focus on the word and immediate context of the word to determine the overall meaning or gist of the word. The interactive model is a blend of the former two models. Under the interactional model, there is constant and varied interaction between the top-down and bottom-up models of reading. This has been the most popular model in the last thirty years (Grabe, 2009; Rayner et al, 2012). It is this final model that frames the theoretical foundation for the current study, given the fact the researcher proposes that both top-down and bottom-up strategies are used in the lexical inference tasks.

Like many studies that have been conducted in the past few decades, the present study seeks to describe patterns of top-down vs. bottom-up strategies in relation to lexical inference. The interactional model is used as a foundation due to the fact that both strategies are expected to be used, and the interaction between the two categories will be examined and described, which is a component of the interactional model that is often highlighted. Researchers have distinguished multiple lexical inference strategies and categorized them as top-down vs. bottom-up. Nassaji
(2003; 2004) created a list of strategies that he has since revised throughout his research into the ways learners use the two categories of strategies. It will be this list of strategies that the research project will be based upon. The studies in this area have varied in focus including such areas as confidence of readers in their choice of strategy used. A study conducted by Mori (2003) revealed the significance of context in guessing the meaning of words, and that a combination of contextually rich clues as well as semantically relevant morpheme clues creates confidence in students who are inferring meaning. Other studies have revealed the significance of the retention based on the category of strategies learners use. One study in particular found that the difficulty and complexity involved in the metacognitive lexical inference could reveal the ability of learners to retain the inferred meaning (Hu & Nassaji. 2011). Two popular research areas that have been investigated in accordance with top-down vs. bottom-up L2 lexical inference strategies are L2 proficiency and L1 transfer. The next two sections will elaborate on these studies.

L1 Transfer of Lexical Inference Strategies

The Contrastive Analysis Hypothesis was posed for many years as the explanation for the errors that occurred in an L2. The hypothesis theorized that learning an L2 was directly affected by a learner’s L1. If a learner made an error in their L2 it was explained as a being a result of a difference between their L1 and L2. The hypothesis was disproved in the 1970’s, yet the concept of a learner’s native language influencing their production and learning of a second language. Today, the concept of L1 transfer reflects remnants of this initial hypothesis. Today, L1 transfer is accepted as being a common occurrence in language learning related activities. As was described in the introduction, the concept of L1 transfer refers to the ways in which a language

learner will bring aspects of their native language into the language they are learning. The term “L2” is applied generally to include all languages learned other than the native language.

With lexical inference strategies, those strategies that are used in a learner’s native language (L1) have been shown to transfer to the language they are learning (L2). Some studies have noted that there are differences in frequency and types of lexical inference strategies between languages (Kieffer, 2012). In the study by Kieffer (2012), it was found that, in general, the morphological components of vocabulary were favored by those learning an L2 instead of the reliance on L2 vocabulary knowledge. Generally, however, there are tendencies that show learners use their L1 while reading in an L2 through using their native language, which is a lexical inference strategy, or using strategies commonly used in their L1 reading (Hamada & Koda, 2010; Maeng, 2005; Roskams, 1998; Seng, 2006; Yamashita, 2002). One approach of these studies has the general intention of arguing for the linguistic interdependence hypothesis that L1 structures and strategies are transferred to the L2. The general concept behind this hypothesis is that when a person develops a skill in a given language that skill will then transfer to the language they are learning (i.e. If a person can read in English, then their methods and abilities to read in English will transfer to the language they are learning) (Grabe, 2009). When considering lexical inference, it would be supposed that the reading strategies for lexical inference in one language would transfer to the target language (L2). This hypothesis is supported in L2 reading when considering the languages Mandarin and Arabic (Abbott, 2010).

Within the area of lexical inference, readers will include knowledge from their L1 as well as compensate for their lack of native intuitions by using a variety of strategies. Generally, reading in a second language requires more effort because the reader needs to interpret what the passage is saying in both their L1 and L2 followed by processing the overall message or ideas
Vocabulary learning as well requires a different level of mental processing. Schmitt (2000) describes learning L2 vocabulary as a process of relabeling all those things that are familiar whereas learning the L1 involves learning about items and ideas at the same time as the initial labeling of that object. Learning an L2 in this sense is restructuring your way of conceptualizing the world. Given the fact that both reading and vocabulary learning are more complex in a second language, it can be deduced that lexical inference in an L2 is also more complex.

Research shows that native Mandarin speakers transfer their reading strategies to English. The strategies have been shown to be used most often by learners who are more proficient, and the more difficult a task is, the more often strategies will be used (Feng & Mokhtari, 1998; Tang, 2007). This is supported by the linguistic interdependence hypothesis. Research has also investigated the reading strategy transfer of native Arabic speakers. Alsheikh (2011) found that participants used more strategies when reading in English, but that in both languages their most common strategies used were consistent. In two studies conducted with university level L2 English language learners, Abbott (2010) investigated whether L1 transfer affected the reading strategies used by native Mandarin and native Arabic speakers. The study found that native Mandarin speakers used more bottom-up approaches than native Arabic speakers. Arabic speakers tended to rely on top-down strategies (2010). Abbott (2010, p. 28) reported that when students came across an unknown word, they tended to “rely on their background knowledge or common sense, which is a top-down strategy.” They also found that accuracy was not dependent on the number of strategies used, but rather the selection and proper use of the strategies (Abbott. 2006, 2010).
One area of weakness of Abbott’s study was the fact that her conclusion was left with a question as to the influence of proficiency. The research states that the proficiency level difference between the two groups may have supported research “findings that differences in bottom-up and top-down strategy use are a function of language proficiency” (Abbott, 2010, p.30). The current study fills that gap by looking at L1 transfer of reading strategies in the context of a university setting, similar to the circumstances designed by Abbott, with the additional element of examining the effects of L2 proficiency.

**L2 Proficiency Effects on L2 Lexical Inferencing**

The effects of L2 proficiency on L2 lexical inferencing strategy use have been investigated thoroughly. To understand the effect of L2 proficiency, it would be best to begin with an explanation of the term proficiency which has been used multiple times throughout this paper and will continue to be used. Within the realm of second language acquisition (henceforth referred to as SLA), proficiency is a term used to describe the ability of a language learner to understand and produce the target language (language they are attempting to learn, referred to throughout this paper as the L2). Within SLA, learners are said to be at or from multiple levels of proficiency (e.g. low, intermediate, high). This means that they have a certain amount of abilities to understand and produce. Thus low levels of proficiency are able to understand and produce basic concepts while intermediate proficiency levels are able to understand and produce slightly more complex concepts. When a learner is said to be “proficient” this often refers to the point when a learner has reached a level between high-intermediate and beyond high.

When considering the concept of proficiency in reading, it is often correlated with proficiency in the language. Given the fact that reading is in fact is an unnatural form of language production and reception (Grabe, 2009; Rayner, 2012). The concept of proficiency in
reading is often referred to as reading ability or reading level. It is similar to proficiency in a language, but applied specifically to the skills necessary as well as the vocabulary necessary to read well. Studies often use a student’s language proficiency with an additional test of their reading proficiency to gauge their overall proficiency. While many languages have been investigated in this area, Mandarin has received particular focus for lexical inference strategy and reading strategy use in relation to proficiency levels. The studies typically would reveal the patterns in strategy use based on proficiency then postulate a possible additional factor that could influence the patterns in strategy use. There was consistency in the overall results of the studies.

Overall, there were differences in strategy use based on proficiency and a general rule most studies agree on is that the most proficient readers used lexical inference strategies more effectively (Nassaji, 2004). It was also found through research that the proficient readers tended to use more strategies in general when reading or inferring in their L2 (Hamada & Park, 2011; Lau, 2006) and those strategies were similar to those used in their L1 (Tsai, 2010; Yau, 2005). Given the large amount of research investigating the effects of proficiency on Mandarin speakers use of strategies and the absence of studies with Arabic speakers in this area, it seems that Abbott’s study cannot be adequately resolved through comparisons of current literature on the subject. This gap in the literature is the motivation behind the objectives of the current study.

As has been shown throughout this review of the literature, language learners use reading and lexical inference strategies in an L2 that are similar to their L1 (Nassaji, 2003; Tsai, 2010). Research reveals proficiency in a language increases, utilizing multiple strategies at once becomes more common. It has also been shown that there are particular types of strategies that become more commonly used as proficiency increases (Hamada & Koda, 2010; Parkibakht, 2005; Pulido, 2009). Given the fact that both L1 transfer and proficiency have been reported to
play a role in lexical inference strategy use, a question is raised as to whether one of these two influences are dominant in L2 lexical inference or if there is a shift from one to the other. In an attempt to answer these questions, the current study investigates patterns of lexical inference strategy use that result from L1 transfer and shifts in those patterns as L2 proficiency increases.
Objectives and Rationale

Study Objective

The aim of the current study was to investigate the different influences on frequency and accuracy of lexical inference strategy use. The current investigation focused on both proficiency levels in English as an L2 and L1 transfer from Mandarin and Arabic. Not only were these two variables being considered in the study, but a variety of other variables presented by the participants will also be discussed in the analysis. The study takes a qualitative approach to the overall analysis with the hope of providing insights into future directions for research on this topic.

Rationale

The research on lexical inference strategies has considered the effects of both proficiency and L1 transfer on lexical inference strategies as well as reading comprehension strategies (Alsheikh, 2011; Hamada & Park, 2011; Nassaji, 2003; Pulido, 2009; Tsai, 2010). A few language specific studies have studied the correlation between L1 transfer and proficiency in regard to reading strategies (Tsai, 2010). These studies have focused on a single language and reading comprehension strategies in general. Abbott conducted a research studies comparing reading comprehension strategies used by native Arabic and Mandarin speakers learning English as a second language (2006; 2010).

While there is a large amount of literature on both lexical inference strategies as well as reading comprehension strategies, there are few studies on lexical inference strategies in Arabic.
Studies have examined both proficiency and L1 transfer effects, but few compared the effects of both variables. No studies to date have compared these two variables in relation to lexical inference specifically. Another component that has not been examined is the comparison of L1 transfer and proficiency with participants with both different L1 backgrounds and varying proficiencies. By making a qualitative investigation into these areas of research, possible trends or influential variables can be revealed with recommendations for future research. The current study attempts to not only fill this gap in lexical inference research, but to also investigate other variables that may play a role in trends of lexical inference strategy use and success.

Research into these areas not only benefits the field of psycholinguistic research, but also has pedagogical implications. By understanding the strategies that are both most commonly used and most successfully used by English language learners, educators can better equip students in ESL and EFL classroom settings with strategies that will be helpful for both vocabulary development as well as reading comprehension. Reading in a second language requires more mental processing than reading in a first language, and in order to compensate for lack of native-like skills in reading, strategy use can be beneficial. More specifically to this study, by understanding the strategies more proficient readers use effectively, students can be encouraged to focus on those methods. Also, if a certain native language background proves to use certain strategies more effectively it could be recommended that strategy instruction be differentiated for learners in an ESL classroom. Just as with the research rationale, by examining other variables – such as participant majors or level of study – this research could provide helpful advise for other factors to consider in the types of reading instruction in ESL and EFL classrooms.
Research Questions

The current research study sought to meet the aforementioned objective by answering the following questions:

1. Are there any patterns in lexical inference strategy use and success based on the learner’s L1?

2. Are there any patterns in lexical inference strategy use and success based on the learner’s proficiency in an L2?

3. Do the patterns based on L1 transfer change as proficiency increases?

4. What other factors may contribute to the differences in lexical inference strategy use and success? (i.e. major area, level of education, etc.)
Methodology

Participants

The data used in the current study came from a total of six participants from a university in the United States. All the participants were international students who at some point in their lives had learned English for academic purposes. Three of the participants were native Mandarin speakers, and three were native Arabic speakers. Not only did the participants vary by native language, but also by English proficiency level. The three participants in each native language group fell into the following three categories: an intermediate level English language student, an undergraduate student, and a graduate student.

Participants were all in their early to mid twenties and had studied English to varying degrees prior to their attendance at the university. All were international students studying in an English speaking setting. Despite the consistency in academic setting, age and second language, they each had distinguishing characteristics. The background of the participants will be described below. In order to protect the anonymity of the participants, pseudo names will be used in all participant descriptions.

Participant 1. Hui was a native Mandarin speaker who had studied English for five years and was at a low-intermediate proficiency level. Four of those five years she studied English in China. She had spent the previous year in America studying English at a university in an intensive English program. At the time of the study, she was beginning the intermediate level of study. After completing the language program, she planned to pursue her Bachelors in
Telecommunications at the university. She reported reading English materials such as news sources, music, poetry, and stories.

Participant 2. Ming was a native Mandarin speaker who had studied English for at least 7 years and was at a proficient level. She studied throughout high school and two years at an American university. She spent half a year in an intensive English program and had spent the rest of her time in academic study. She was pursuing her Bachelors in Telecommunications at the university. She reported reading textbooks and articles for her academic classes as well as novels and short stories.

Participant 3. Cai was a native Mandarin speaker who had studied English for 13 years and was proficient in the language. She was pursuing her Masters in TESOL from the university and had completed two semesters at the university at the time of the study. She entered directly into the program and did not attend a language program. She reported mostly reading textbooks and articles for her classes.

Participant 4. Mona is a native Arabic speaker who had studied English for 10 years at the time of the study and was at an intermediate proficiency level. She had spent the preceding few months in an intensive English program at the university. Both Cai and Mona were in level three which was the first of the intermediate levels in the seven level program. Mona was slightly higher in proficiency than Cai, but their reading proficiency was comparable. Both Mona and Cai reported having the same reading interests. After the language program, Mona planned to pursue her bachelor’s degree in Computer Science at the university.

Participant 5. Amir is a native Arabic speaker who had studied English for two and a half years at the university. While Amir did not report any study prior to that time, it might be assumed due to his proficiency in the language that he had been studying the language longer
than two years. Since that information is not provided in the data, however, such an assumption would be inadvisable. At the time of the study, Amir was pursuing his Bachelors in Risk Management and Insurance. The fact that he was in the midst of his undergraduate studies validates the presumption that he was proficient in English due to the fact that proficiency in English was a requirement to enroll in an academic program at the university. He had lived in the United States for two years while at the university. Similar to Ming, Amir partook in both recreational and academic reading. This is important to note for the discussion later in this paper.

**Participant 6.** Zaira was a native Arabic speaker who had studied English for 18 years and was proficient in English. At the time of the study, she was pursuing her masters in Linguistics from the university. She had lived in the United States for two years prior to this study. She had studied French as well as English and had previously worked as an English-Arabic translator. Similar to Hui, Zaira also reported reading mostly articles and textbooks.

Given the diverse group of participants the results will focus on the qualitative components of the study and the analysis of the results will be primarily descriptive. The focus of the study is on the proficiency level and L1 background, but all variables will be taken into consideration – with the exception of gender – in considering the results and possible patterns of lexical inference that might be studied in the near future.

**Materials**

As mentioned earlier, the objective of this study was to study lexical inference strategies and compare two variables that have been the focus of many previous studies on the subject. Due to this fact, previous studies that have focused on L2 proficiency and L1 transfer in relation to both reading strategies and lexical inference were used as guides for the current study.
**Think aloud.** The lexical inference task used in this study was modeled after previous lexical inference research studies. A think-aloud was used since it is a common method of data elicitation for lexical inference tasks (Haastrup, 1999; Hamada & Park, 2011; Lawson & Hogben, 1996; Nassaji, 2004). Though think-alouds cannot completely capture natural thought processes, they are a way of observing the metacognitive processes of readers. Studies have shown that though there is a slight disconnect between the thought process and the verbal recall of the thought, the think-aloud process does not adversely affect the comprehension of the passage or lexical inference process (Leow & Morgan-Short, 2004).

The passage used in the present studied has been used in two previous studies (Haastrup, 1999; Nassaji, 2004). The passage was written two decades ago; however, the content still pertains to the present day and is relatable to international students. The topic of the passage dealt with flaws in the world healthcare organization and the differences in healthcare provided for the rich world versus the poor world. In the passage the content is easy to understand, but there are a few low frequency words that in the previous studies had been highlighted in order that participants would infer the meaning. These words were retained, three were changed into pseudo-words and four pseudo-words were added to the passage.

Pseudo-words were used in the passage for a couple of reasons. First, two of the participants in the study were proficient in the language to the point that they were near-fluent, and there was a possibility they would be familiar with some of the low frequency words. By adding in pseudo-words all participants would have at least seven words of which they would need to infer the meaning. Secondly, guessing a word based on similarity in sound, structure, or word part (morpheme) to another lexical unit is a common lexical inference strategy. The pseudo-word creation was designed to elicit this possible response from participants.
The pseudo-words were created through a process of using common lexical units already present in the passage and changing the first phoneme. No phoneme transformations were based on voicing in order to make sure the new words were not easily mistaken for the original lexical unit when reading aloud (Reference Appendix A). The pseudo-words needed to appear as new words to the participants with similarities to known English words. The pseudo-words were underlined and participants were informed ahead of time they were meant to infer the meaning of the underlined words (Reference Appendix B).

**Questionnaire.** The research into the correlation between L2 proficiency and L1 transfer has dealt with reading strategies in general and has not focused on lexical inference. In order to adequately compare the results of the current study with those that have been conducted previously, a questionnaire – the method of data collection for those studies on Mandarin and Arabic reading strategies that are most closely related to the present objectives – was administered to the participants after the lexical inference task (Alsheikh, 2011; Tsai, Ernst & Talley, 2010).

The questionnaire was divided into five sections (Reference Appendix C). The first section included one question that asked for a code given to each participant. The code included either an ‘M’ or ‘A’ to represent the participant’s native language background and a number from one to three to represent their estimated proficiency level. The code was handed to the participant at the conclusion of the think-aloud task while the researcher explained the questionnaire procedures.

The second section included eight questions about the demographic information of the participant. These questions requested the following information: native language, length of
English study, favored English reading genres, gender, level of academic program, major, length of stay in an English speaking country and age.

The third through fifth sections were all focused on reading comprehension and were adapted from the studies conducted by Tsai, et al. (2010) and Alsheikh (2011). The questions were written to elicit responses about the reading strategy practices of the participants. In other words, for a given number on the questionnaire a reading strategy was listed and the respondent was meant to select how often they used that particular strategy when reading according to a likert scale. The strategies were written in simple terminology in a descriptive format so the participant would understand what was being asked (i.e. asking if they thought about what they already knew about a topic instead of asking whether they used background knowledge). For each strategy, the participants had a choice between the following options on a likert scale to report on how often they used the strategy: never, rarely, sometimes, often, all the time. Each section included eight strategies based on a particular category of reading strategies that mirrored those used in the studies listed above.

The third section was focused on global strategies and asked about how often participants used common strategies to understand overall what they were reading. The different strategies related to common reading practices and included the following: confirming predictions, eliciting background knowledge, scanning, noticing text features, using context clues, evaluating, and checking for understanding.

The fourth section focused on problem-solving strategies and asked how often participants used certain strategies when they had trouble understanding a passage. The strategies mentioned related to the following types of techniques: speed of reading, focusing, re-reading, distractions, pausing, visualizing, and guessing.
The fifth section focused on utilizing reading resources. The strategies related to the following resources and techniques: taking notes, reading aloud, using dictionaries, paraphrasing, asking questions, translating, comparing, and skipping.

**Procedures**

Just as with the material creation, the procedures for the data collection mirrored those studies that had already been previously conducted. The think-aloud was mirrored after other lexical inference studies (Haastrup, 1999; Hamada & Park, 2011; Lawson & Hogben, 1996; Nassaji, 2004; Pulido, 2009). The think-aloud was recorded using SoundCloud and all recordings were saved privately, downloaded to a password protected flash drive and then deleted from SoundCloud. All transcriptions were also stored on the researcher’s flash drive. The questionnaire procedures were conducted according to the most appropriate for the data collection. By using an online survey format, the participants could complete the survey in a timely manner and the data would be easily accessible to the researcher.

**Think-aloud.** The procedure for the think-aloud is outlined in the study protocol (Reference Appendix D). The participants met one-on-one with the researcher to complete the think-aloud. They were asked to read a passage silently so that they would be familiar with the passage overall. After they read through it silently, they were asked to read it aloud and stop after each sentence that had an underlined word. When they paused they were asked to describe what they were thinking as they determined the meanings of the underlined words. For the majority of the participants, the researcher prompted further explanation about their rationale for the meanings they inferred.

Before they began, the participants were told to infer the meaning of any lexical units they did not know besides those underlined, but no participant did this while reading the passage
aloud the first time. The researcher listened to both changes in speech rate, pauses, change in intonation, and errors in pronunciation to gauge possible words to ask each participant to describe at the conclusion of the think-aloud. The participants were first asked if there were any words they did not know. If the participant paused for longer than five seconds, the researcher pointed out a word the participant seemed to struggle with as they were reading. In all cases, the participants reported they did not know the word and inferred the meaning of the given word. When the underlined words and the additional words were combined, the participants inferred the meaning an average of ten words each.

At the conclusion of the think-aloud the participants were asked to summarize the passage they had just read. This summary showed the researcher whether the participant comprehended the passage. It also inadvertently revealed different reading strategies the participants commonly used. Finally, it reinforced the proficiency categorization of the researcher. There were five question options pre-decided by the researcher to elicit responses from participants (Reference Appendix D: Protocol).

**Questionnaire.** The questionnaire was created online using the website esurveyspro.com. Access to the survey was provided through a URL link that was given to the participants. Four of the six participants completed the survey at the time of the think aloud. Two of the participants completed the survey at a later date after being emailed the survey link by the researcher. The participants were instructed to input their participant code in the first section and then answer all of the questions according to the directions.

All responses were stored on the researcher’s online account and then transferred to an excel document. The participant data was coded and kept in a document along with the coded
responses from the think-aloud data. The coding procedures will be further discussed with the
description of the analysis.
Data Analysis Procedures

The think-aloud and questionnaire were both coded according to the conventions of the previous studies referenced throughout the methodology. Both sets of data were coded and analyzed separately. These analyzes were then compared and contrasted and cross-referenced with previous research to see if any generalizations could be made.

Variables

Both independent and dependent variables were taken into consideration throughout the analysis of the data. Independent variables included proficiency, L1 background, major areas of study, and level of academic study. Dependent variables for the think-aloud were the frequency of the sources of knowledge used for inferencing, the frequency of lexical inference strategies used, the accuracy of the lexical inference, and possible correlations between patterns of strategies and sources of knowledge and the accuracy of the lexical inference. Dependent variables of the questionnaire were the reading comprehension questions according to the three categories and the responses of the participants to the questions, which were coded according to the likert scale. The dependent variables were analyzed separately then according to the independent variables as will be described in the following two sections.

Think-aloud

The think-aloud sessions were recorded by the researcher. After meeting individually with the six participants, the meetings were listened to in their entirety by the researcher. Then the portions of the recordings in which the participants inferred the meanings of both the pseudo
words and unknown words were transcribed. The researcher began transcribing when the participant paused reading in order to describe what they were thinking and possible meanings of the words. The transcription ended when the participant began reading aloud again. On average, 57.1% of the recorded think aloud was transcribed. The transcriptions were checked to make sure that they matched what the participants actually said. The analysis consisted of the researcher first reading over the transcriptions according to participants to get an idea of the different strategies used as well as any tendencies shown by individual participants. The transcriptions were then re-organized by the seven words that all participants inferred for detailed analysis.

These transcriptions were typed and first coded according to the coding designed by Nassaji (2003). Nassaji’s lexical inference study used knowledge source, strategy, and accuracy as coding categories (Reference Appendices E & F). Table 1 illustrates the revised categories

**Table 1. Revised Knowledge Source Coding Scheme**

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical</td>
<td>Using knowledge of grammatical functions or syntactic categories, such as verbs, adjectives, or adverbs</td>
<td>GRAM</td>
</tr>
<tr>
<td>Morphological</td>
<td>Using knowledge of word formation and word structure, including word derivations, inflections, word stems, suffixes, and prefixes</td>
<td>MOR</td>
</tr>
<tr>
<td>World</td>
<td>Using knowledge of the content or the topic that goes beyond what is in the text Attempting to figure out the meaning of the new word by translating or finding a similar word in the L1</td>
<td>WOR</td>
</tr>
<tr>
<td>L1 Knowledge</td>
<td>Using knowledge about the relation between or within sentences and the devices that make connections between the different parts of the text.</td>
<td>L1</td>
</tr>
<tr>
<td>Discourse</td>
<td>Using knowledge about the overall theme or the main idea to infer the meaning of an unknown word.</td>
<td>DIS</td>
</tr>
<tr>
<td>Theme</td>
<td></td>
<td>THE</td>
</tr>
</tbody>
</table>
The same categories were used, but revisions were made to better suit the present dataset.

After the first few examinations of the current data, the researcher added the source “theme knowledge” to the five initial knowledge sources. The individual knowledge sources used are outlined in Table 1 above.

Not only were the transcriptions analyzed for knowledge sources, but they were also analyzed for strategies based on studies by Nassaji (2003, 2004). There were six strategies investigated in the study. A seventh strategy appeared in the investigation, but it was not used in the analysis due to the focus of the study. A couple of the participants mentioned skipping the unknown words and still being able to understand the syntactic and discourse context. This method of skipping unknown words is a recognized reading strategy, but given the fact that the think-aloud research was meant to investigate the ways participants guessed the meaning of unknown words, the lack of guessing will not be included in the results and analysis. The six strategies were distinct from the knowledge sources. The six strategies used by Nassaji (2004) were divided into three separate categories. The coding for the strategies is listed in Table 2.

Table 2. Revised Inference Strategy Coding Scheme

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating</td>
<td>Repeating any portion of the text including the word, the phrase, or the sentence in which the word has occurred.</td>
<td>RE</td>
</tr>
<tr>
<td>Verifying</td>
<td>Examining the appropriateness of the inferred meaning by checking it against the wider context.</td>
<td>VER</td>
</tr>
<tr>
<td>Self-inquiry</td>
<td>Asking oneself questions about the text, words, or the meaning already inferred.</td>
<td>SI</td>
</tr>
<tr>
<td>Analyzing</td>
<td>Attempting to figure out the meaning of the word by analyzing it into various parts or components.</td>
<td>LYZ</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Showing a conscious awareness of the problem or the ease or difficulty of the task.</td>
<td>MON</td>
</tr>
<tr>
<td>Analogy</td>
<td>Attempting to figure out the meaning of the word based on its sound or form similarity with other words.</td>
<td>LOG</td>
</tr>
</tbody>
</table>
The transcripts were analyzed and coded for both knowledge sources and strategies. All coding was documented and checked twice. A strategy or knowledge source was counted only once per word inferred. For instance, if a participant repeated multiple words or phrases when trying to infer the meaning of a single word, they would be said to have used “repeating” for that word, and it would count as a single act of “repeating.” Each time a participant used a knowledge source or strategy it was counted as one point for that category. The strategy and knowledge source points for the seven pseudo words were totaled and analyzed by the researcher. After the pseudo words were analyzed, the remaining unknown words were then analyzed according to the overall findings and individual participants.

The results were first analyzed to find the general trends in strategy use of each participant. The trends included the frequency of strategy use, frequency of knowledge source, the accuracy of inference, relations between strategy use and accuracy, relations between knowledge source and accuracy, and relations between strategy use, knowledge source and accuracy. The responses were compared and contrasted according to language background followed by proficiency level. The language background (i.e. L1 transfer) was analyzed in relation to reading strategy tendencies that have been found in previous research to be language specific to both Arabic and Mandarin (Abbott, 2006). These analyses were then compared to determine if there was a relationship between proficiency and L1 transfer of strategy use.

Overall, the trends in strategy use and accuracy were analyzed qualitatively. Multiple variables were postulated as possible variables other than proficiency and L1 transfer that could be determining factors of strategy use and success. These are described in the analysis portion of the current paper.
**Questionnaire**

The questionnaire responses from the likert scale were coded from one to five with five representing the option “all the time” and one representing the option “never.” The analysis calculated the various responses from the three respondents in each L1 group. The study conducted by Tsai (2010) compared proficiency to L1 transfer while the study conducted by Alsheikh (2011) only examined L1 transfer. For this reason, strategy categorization into global, problem solving, and resource utilization as well as the analysis of the study was modeled after Alsheikh’s study.

The current study compared the responses of each L1 group using a t-test and cross-referenced the findings with the previous studies. A descriptive analysis detailed the common strategies reported and the ways in which the results both resembled and diverged from the previous findings. These findings were finally compared to the lexical inference strategy patterns to see if any general reading strategy trends emerged in both reading comprehension and lexical inference strategies.
Results

Results of Think-Aloud

In this section, the overall results of the analysis that focused on the seven pseudo words are first presented to show the general trends amongst participants. The analyses of the data including the unknown words that varied by participants will be included with the results of the individual participants following the overall results.

Overall the participants used a variety of strategies, yet there were a few preferential strategies and knowledge sources amongst all of the participants. All participants used more than one knowledge source or reading strategy throughout the task. For all six participants, the total number of knowledge sources and strategies they used totaled 121. The average number of strategies per participant were 20.2 and the standard deviation of overall strategy use was 5.1. The participants each used more than one strategy and the average number of strategies used per word by participants is listed in Table 3 along with an outline of the participants’ backgrounds.

Table 3. Overall Strategy Totals.

<table>
<thead>
<tr>
<th>Participant</th>
<th>L1 Background</th>
<th>Years of Study</th>
<th>Academic Level</th>
<th>Total # of Strategies</th>
<th>Average # per word</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cai</td>
<td>Mandarin</td>
<td>5</td>
<td>Intermediate</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Ming</td>
<td>Mandarin</td>
<td>2</td>
<td>Bachelors</td>
<td>18</td>
<td>2.6</td>
</tr>
<tr>
<td>Hua</td>
<td>Mandarin</td>
<td>13</td>
<td>Masters</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>Mona</td>
<td>Arabic</td>
<td>10</td>
<td>Intermediate</td>
<td>17</td>
<td>2.4</td>
</tr>
<tr>
<td>Amir</td>
<td>Arabic</td>
<td>2.5</td>
<td>Bachelors</td>
<td>20</td>
<td>2.9</td>
</tr>
<tr>
<td>Zaira</td>
<td>Arabic</td>
<td>18</td>
<td>Masters</td>
<td>24</td>
<td>3.4</td>
</tr>
</tbody>
</table>
As can be seen in Table 3, the total number of strategies used by the individuals was a range of 14 to 28. The general trend (noted in Table 3) was the more proficient students used more strategies. While the time of study for both Amir and Ming was less than the other participants, from discussions with the participants, the researcher learned that both of these participants had studied English prior to coming to the university. Based on the fact that both participants had passed through the Intensive English Institute and both participants gave detailed summaries of the readings it can reliably be reported that both participants were proficient English readers.

The total, mean and standard deviation for individual strategy use of participants were calculated to determine whether the participants did indeed have select strategies they used more often than others. The totals, mean, and standard deviations are listed in Table 4 along with the total, mean and standard deviation for the participants overall.

Table 4. Strategy Use Mean and Standard Deviations.

<table>
<thead>
<tr>
<th>Strategy Use Participant</th>
<th>Total</th>
<th>Mean</th>
<th>Stand Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cai</td>
<td>14</td>
<td>1.2</td>
<td>1.3</td>
</tr>
<tr>
<td>Ming</td>
<td>18</td>
<td>1.5</td>
<td>1.9</td>
</tr>
<tr>
<td>Hua</td>
<td>28</td>
<td>2.3</td>
<td>2.6</td>
</tr>
<tr>
<td>Mona</td>
<td>17</td>
<td>1.4</td>
<td>1.9</td>
</tr>
<tr>
<td>Amir</td>
<td>20</td>
<td>1.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Zaira</td>
<td>24</td>
<td>2.0</td>
<td>2.1</td>
</tr>
<tr>
<td><strong>OVERALL</strong></td>
<td><strong>121</strong></td>
<td><strong>10.1</strong></td>
<td><strong>10.2</strong></td>
</tr>
</tbody>
</table>

From the relationship between the mean and standard deviation, it can be observed that the participants used certain strategies more often than others. It can be seen in Table 4 that of the twelve knowledge sources and reading strategies, the participants had preferences. The most common knowledge source used was “discourse”, which contrasted with Nassaji’s study that
showed “discourse” was the least common strategy used (2003). The least common strategy used in the present study was “morphological” knowledge, which was not used in any of the instances that students attempted to infer the meaning of the seven pseudo words nor any of the unknown words. The most common strategies were “verifying” and “repeating.” The least common were “self-inquiry” and “analyze.” Table 5 shows the overall use of each individual strategy as well as the percentage of times it was used in relation to the number of possible time it could potentially have been used.

**Table 5. Overall Strategy Usage**

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total</th>
<th>Usage</th>
<th>Inference Strategies</th>
<th>Total</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>14</td>
<td>33.33%</td>
<td>Repeat</td>
<td>18</td>
<td>42.86%</td>
</tr>
<tr>
<td>Morphology</td>
<td>0</td>
<td>0.00%</td>
<td>Verify</td>
<td>20</td>
<td>47.62%</td>
</tr>
<tr>
<td>Grammar</td>
<td>9</td>
<td>21.43%</td>
<td>Self-Inquiry</td>
<td>1</td>
<td>2.38%</td>
</tr>
<tr>
<td>Discourse</td>
<td>34</td>
<td>80.95%</td>
<td>Analyze</td>
<td>1</td>
<td>2.38%</td>
</tr>
<tr>
<td>Theme</td>
<td>2</td>
<td>4.76%</td>
<td>Monitor</td>
<td>12</td>
<td>28.57%</td>
</tr>
<tr>
<td>L1</td>
<td>4</td>
<td>9.52%</td>
<td>Analogy</td>
<td>6</td>
<td>14.29%</td>
</tr>
</tbody>
</table>

Table 5 shows that there are clear preferences by the participants overall. The preferences are clearer when looking at individual participants. The individual preferences of the participants will be included in the analysis of their individual performance as well as the analysis of their performance in relation to other participants.

As described earlier, the accuracy of the inferences was coded on a three point scale (i.e. 0-inaccurate, 1-partially accurate, 2-accurate). A score was given to each participant based on the total number of words they inferred. The accuracy ratings were totaled and divided by the total possible score based on the number of words. The possible score was the total number of words inferred doubled since the possible rating for each word was two. The participants’ accuracy scores are presented in Table 6.
Table 6. Participant Accuracy Scores

<table>
<thead>
<tr>
<th>Participant</th>
<th>Total Words</th>
<th>Inferred Accuracy Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cai</td>
<td>10</td>
<td>5.00%</td>
</tr>
<tr>
<td>Ming</td>
<td>11</td>
<td>27.27%</td>
</tr>
<tr>
<td>Hua</td>
<td>8</td>
<td>37.50%</td>
</tr>
<tr>
<td>Mona</td>
<td>9</td>
<td>22.22%</td>
</tr>
<tr>
<td>Amir</td>
<td>11</td>
<td>31.82%</td>
</tr>
<tr>
<td>Zaira</td>
<td>8</td>
<td>43.75%</td>
</tr>
</tbody>
</table>

The overall accuracy scores from the participants reveals that just as the overall number of strategies increases, the accuracy scores also increase with proficiency level in each L1 group. The Arabic L1 group overall had higher accuracy scores. The small participant pool included in this study, however, inhibits any generalizations. The accuracy scores for the participants are plotted out in Chart 1 along with the strategy and knowledge source totals. It is clear in Chart 1 that even though the accuracy scores do not correlate directly with the strategy use, there is a general trend that when the strategy use is higher, the accuracy score increases.

Figure 1. Strategy and Accuracy Trends

Analysis of Individual Participants

For each participant, their readability score was calculated based on the percentage of words they reported being able to understand. The number of words that they stated they did not
know the meanings of and inferred was subtracted from the overall word count. These scores are reported below for each participant. The accuracy score and patterns of knowledge source and strategy use are also described. The accuracy score is the percentage of accuracy points a participant received divided by the total number of possible accuracy points for that participant. Also, the lexical inference strategy preferences are put into the context of the reported reading strategies from the questionnaire.

Cai reportedly had a readability score of 97.0% having reported being unable to understand 10 words in the passage. She had an accuracy score of 5.0%. She reported using the following reading strategies all of the time: evaluating as she read, checking her understanding, focusing on important sections, rereading portions of the text, taking notes, and using a dictionary. She reported not using strategies that involved looking at the text structure, guessing word meaning, visualizing the text, self-inquiry, sounding out words, comparing words, and paraphrasing text. From these observations it would appear that she preferred to focus on the details in the text instead of understanding the overall idea of the text. This approach could be said to be bottom-up.

Taking this into consideration, her lexical inference strategy use would be hypothesized to follow this general trend. Overall she inferred the meanings of 10 words from the passage, and she used the discourse knowledge source most often. She also used analogy and grammar knowledge more often than others. It seems appropriate that she would use discourse knowledge and grammar knowledge, yet the use of analogy, which involves finding connections between words based on sound or form, does not seem to correlate with her report that she rarely sounds out words or compares words. Cai’s accuracy was very low, since she was only able to infer one
word partially accurately. She used both world knowledge and discourse knowledge to infer this particular word. The actual knowledge sources and strategies used are represented in Table 7.

Table 7. Cai Strategy Use.

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total</th>
<th>Usage</th>
<th>Inference Strategies</th>
<th>Total</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>2</td>
<td>10.5%</td>
<td>Repeating</td>
<td>2</td>
<td>10.5%</td>
</tr>
<tr>
<td>Grammar</td>
<td>3</td>
<td>15.8%</td>
<td>Verifying</td>
<td>1</td>
<td>5.3%</td>
</tr>
<tr>
<td>Discourse</td>
<td>6</td>
<td>31.6%</td>
<td>Analogy</td>
<td>3</td>
<td>15.8%</td>
</tr>
<tr>
<td>L1</td>
<td>2</td>
<td>10.5%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cai used multiple knowledge sources and strategies when inferring words, with the exception of “squalor.” For squalor, she failed to use any knowledge sources or strategies but instead simply guessed the type of word it might be without referencing any clues. There was only one combination of reading strategy and knowledge source that was used more than once throughout the inferencing: analogy was always paired with only discourse knowledge, but never led to accuracy.

Ming had a readability score of 96.7% having reported being unable to understand 11 words in the passage. Her inference accuracy score for the inferences of those 11 words was 27.3%. In regards to reading strategies, she reported using both the structure and features of a text as well as the context of what was being read. She also reported often using problem-solving strategies such as focusing, pausing, rereading, and guessing. She reported using all of the resources, but the ones she reported using all the time were the following: taking notes, reading aloud, and paraphrasing. While she used many resources and problem solving strategies, she reported not using scanning, topic knowledge, evaluating, and predicting. There does not appear to be a clear reading approach, but there are connections that can be observed from the reported strategies and the lexical inference strategies.
Through her lexical inference task, Ming reported skipping words, guessing meaning, rereading the text multiple times, checking her understanding, and her most common knowledge source was using the context of the passage. All of these tendencies match up with her preferred reading strategies. Discourse knowledge was used most of all the knowledge sources, with grammar being used for only 2 of the 11 words and world knowledge used once. The knowledge sources tended to be accompanied by a reading strategy with the exception of “permeated” for which Ming only used discourse and grammar knowledge in her inference. The strategy usage is more evenly distributed with repeating and verifying being the most common. The totals and usage percentages can be found in Table 8 below.

Table 8. Ming Strategy Use.

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total</th>
<th>Usage</th>
<th>Reading Strategies</th>
<th>Total</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1</td>
<td>3.7%</td>
<td>Repeating</td>
<td>6</td>
<td>22.2%</td>
</tr>
<tr>
<td>Grammar</td>
<td>2</td>
<td>7.4%</td>
<td>Verifying</td>
<td>4</td>
<td>14.8%</td>
</tr>
<tr>
<td>Discourse</td>
<td>9</td>
<td>33.3%</td>
<td>Monitoring</td>
<td>3</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Analogy</td>
<td>2</td>
<td>7.4%</td>
</tr>
</tbody>
</table>

Hua reportedly had a readability score of 97.6% having reported being unable to understand 8 words in the passage. Her accuracy score for those 8 inferences was 37.5%. She reported using noticing structures and features of a text, using context clues, and checking for understanding often or all the time. These tendencies were reflected in her lexical inference task in that she used the discourse knowledge and verifying strategy more than other knowledge sources and strategies. The problem strategies she reported using were reading carefully, focusing and slowing down, paying close attention, re-reading, and visualizing what she was reading. She reported using the resources of taking notes, using dictionaries, and comparing words to other words. These patterns follow with her use of grammar and L1 knowledge sources.
Just as with Ming and Cai, discourse knowledge was the most common knowledge source that Hua used. Her most common strategy was verifying, and her second most common knowledge source was grammar. In the inference task, she used all three of these strategies when inferring the meaning of the first six out of the eight words. She followed a pattern during these inferences: 1) determine the part of speech 2) use the context to determine the meaning 3) verify the meaning inferred. It would appear that she used these effectively due to the fact that this combination led to four of six inferences being either partially or completely accurate. Overall, she used multiple knowledge sources and strategies ranging from 5 to 2 per inference. The totals and percentages of her usage of knowledge sources and strategies can be found in Table 9.

Table 9. Hua Strategy Use.

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total</th>
<th>Usage</th>
<th>Inference Strategies</th>
<th>Total</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>3</td>
<td>10.0%</td>
<td>Repeating</td>
<td>3</td>
<td>10.0%</td>
</tr>
<tr>
<td>Grammar</td>
<td>6</td>
<td>20.0%</td>
<td>Verifying</td>
<td>6</td>
<td>20.0%</td>
</tr>
<tr>
<td>Discourse</td>
<td>8</td>
<td>26.7%</td>
<td>Inquiry</td>
<td>1</td>
<td>3.3%</td>
</tr>
<tr>
<td>L1</td>
<td>1</td>
<td>3.3%</td>
<td>Analyzing</td>
<td>1</td>
<td>3.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Monitoring</td>
<td>1</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

Mona had a readability score of 97.3% having reported being unable to understand 9 words in the passage. Her accuracy score for her inferences of those 9 words was 22.2%. She reported most often using the following reading strategies: considering the topic, using context clues, and evaluating while reading. She reported using all problem-solving strategies except paying close attention to what she is reading. Finally, the only resources she reported using often were note taking and translating from English to Arabic.

During the lexical inference task, she used a total of 21 knowledge strategies and inference strategies. Discourse was the most common knowledge source used which correlates with the reading strategy of using context clues. Repeating, verifying, and monitoring were the
most common inference strategies, which correlate with the idea of problem solving and evaluating. There were no particular patterns between accuracy and strategy use, but there were some patterns overall in the different uses of strategies. Discourse and world knowledge were never used in the same inference. If Mona used the strategy of monitoring, she also used discourse and repetition. In the three instances when this occurred she was able to find a word that fit the context accurately, though only two were somewhat accurate in relation to the real meaning.

Table 10. Mona Strategy Use.

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total Usage</th>
<th>Inference Strategies</th>
<th>Total Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>9.5%</td>
<td>Repeating</td>
<td>19.0%</td>
</tr>
<tr>
<td>Discourse</td>
<td>33.3%</td>
<td>Verifying</td>
<td>14.3%</td>
</tr>
<tr>
<td>L1</td>
<td>4.8%</td>
<td>Analyzing</td>
<td>4.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring</td>
<td>14.3%</td>
</tr>
</tbody>
</table>

Amir had a readability score of 96.7% having reported being unable to understand 11 words in the passage. His accuracy score for the inferences of those 11 words was 31.8%. He reported that he always used the strategy of noticing text features. He also reported that he often used the following reading strategies: thinking about the topic, using context clues, checking for understanding, and predicting what will happen. Like Mona, Amir reported that he used all of the problem-solving strategies. The only resource he used often was to skip words he did not understand. Overall, this shows that Amir is able to focus on the broad perspective as he reads to grasp the gist of the passage.

The inference strategies used reflect the same overarching idea represented by the reading strategies. Of the six participants, Amir was one of the few that used “theme” knowledge to discern the meaning of the unknown word. Just as with the other participants, he used discourse
most often. He used repeating, verifying, and analogy consistently. The total results can be found in Table 10. There was a definite pattern in strategy use and accuracy for Amir. There were three words that Amir was able to infer with complete accuracy. All three of those words were inferred using the analogy strategy.

**Table 11. Amir Strategy Use.**

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total Usage</th>
<th>Inference Strategies</th>
<th>Total Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>3</td>
<td>10.7%</td>
<td>Repeating</td>
</tr>
<tr>
<td>Discourse</td>
<td>9</td>
<td>32.1%</td>
<td>Verifying</td>
</tr>
<tr>
<td>Theme</td>
<td>2</td>
<td>7.1%</td>
<td>Monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Analogy</td>
</tr>
</tbody>
</table>

**Zaira** reportedly had a readability score of 97.6% having reported being unable to understand 8 words in the passage. Her accuracy score for the inferences of those 8 words was 43.8%. She reported using all of the reading strategies either often or all of the time with the exception of the following: thinking about a topic, predicting, skipping words, and reading slowly. The idea that “thinking about the topic” was reported as a less known and less used strategy and yet the participant used the topic or theme to determine the meaning of an unknown word in the wilderness.

She used a variety of inference strategies to determine the meanings of unknown words. The most common of the knowledge sources and strategies were discourse and repeating. Her overall totals and usage percentages can be found in Table 12 There were no patterns between strategy use and accuracy. She used multiple strategies per word that ranged from 5 to 2. Her use of theme knowledge and world knowledge was similar to that of Amir. She clearly understood the purpose and general idea of the passage and she used that to assist in inferring the words. Unlike Amir, however, she was able to use multiple strategies effectively and did not depend on
just one or two. Her method of effectively using the appropriate strategies depending on the
given situation was similar to Hua.

Table 12. Zaira Strategy Use.

<table>
<thead>
<tr>
<th>Knowledge Source</th>
<th>Total</th>
<th>Usage</th>
<th>Inference Strategies</th>
<th>Total</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>4</td>
<td>16.0%</td>
<td>Repeating</td>
<td>5</td>
<td>20.0%</td>
</tr>
<tr>
<td>Grammar</td>
<td>1</td>
<td>4.0%</td>
<td>Verifying</td>
<td>3</td>
<td>12.0%</td>
</tr>
<tr>
<td>Discourse</td>
<td>7</td>
<td>28.0%</td>
<td>Inquiry</td>
<td>1</td>
<td>4.0%</td>
</tr>
<tr>
<td>Theme</td>
<td>1</td>
<td>4.0%</td>
<td>Monitoring</td>
<td>3</td>
<td>12.0%</td>
</tr>
</tbody>
</table>
Discussion

Given the qualitative nature of this study, the relationships between variables will be described, but further research would need to be conducted to ascertain the validity of the analyses.

L1 Background: Are there any patterns in lexical inference strategy use and success based on the learner’s L1?

As has been previously stated, the six participants were divided into two groups based on their L1 background. There were a few tendencies shown by the two groups. First, the knowledge source “theme” was only used with the Arabic L1 background group. Also, overall the Arabic L1 background group had higher accuracy rankings. This correlates well with the study conducted by Abbott (2006; 2010) that found that the participants with an Arabic L1 were the ones who tended to look at the passage holistically. This was a common trend amongst the Arabic participants.

The Mandarin L1 group used L1 knowledge and grammar knowledge more often than the Arabic group and reported taking notes and using text focused strategies more often. Generally, these findings seem to correlate with previous research that found that Mandarin speakers focused more on bottom-up strategies versus top-down (Abbott, 2006; 2010). While the Arabic L1 group had slightly higher accuracy scores overall, no generalizations can be made due to the small number of participants.
**L2 Proficiency:** *Are there any patterns in lexical inference strategy use and success based on the learner’s proficiency in an L2?*

The general trends depending on proficiency are more obvious in this study. As proficiency increased, the more strategies each group used. The accuracy also increased as the proficiency and strategy use increased. This trend has been confirmed in other research studies on the topic. It appeared that the more proficient readers also preferred certain strategies or strategy combinations that led to accuracy. The strategies themselves were not consistent and a great deal depended on the particular word and the individual participant.

It might be gathered from this observation, that though there are certain strategies that lead to accurately inferring the unknown word, each student will have strategies that work best for their personal needs. The use of multiple types of strategies did however appear as a common trend with increasing accuracy. Based on this fact, it might be advised that instructors do not focus on one particular vocabulary or reading strategy, but provide students with instructions in multiple strategies as well as practice dealing with ways to combine them effectively.

**Variable Relationship:** *Do the patterns based on L1 transfer change as proficiency increases?*

While it was hypothesized that as L2 proficiency increased the strategies used would change, it so happened that both L1 groups demonstrated preferences for strategies closely related to their L1, and the diversity of those strategies increased as L2 proficiency increased. This shows that with knowledge of the language, comes the ability to use different tools and structures to solve problems (such as not knowing the meaning of a given word) while you are reading. In many ways, this confirms what other research has found on the subject (Nassaji, 2003; Abbott 2006; 2010; Tsai, 2010).
Academic Level and Programs of Study: What other factors may contribute to the differences in lexical inference strategy use and success? (i.e. major area, level of education, etc.)

While the proficiency level and L1 background did indeed seem to influence the strategy use of the students, there also was a third variable that influenced the inferencing: academic area of study. When I use the phrase “area” I am referring to both level and program. The participants varied in academic area and this showed in the inferencing task. The intensive English program students tended to make general inferences that clearly reflected their L1 background. Cai focused on word structure and purpose while Mona focused on the main idea of the passage. Cai used grammar and L1 more often than Mona and offered more vague responses. When summarizing she used specific examples from the text as support instead of offering general information. Mona, on the other hand, made sure to summarize everything she had read before the researcher requested it of her. Her summary was very general, and she added in her own perspective. This difference in approach shows a distinction between a bottom-up and top-down focus. With all but two of her inferences she used discourse knowledge as well as doing a great deal of repeating and verifying what the passage said.

When analyzing the inferences from Ming and Amir, who both were in undergraduate programs involving business, there was a common theme of skipping words they did not understand. Ming at one point even stated that under normal circumstances she would simply skip the word and see if the sentence still made sense. Amir only selected “skipping words” as a resource strategy on the questionnaire. The other two groups focused on evaluating or understanding the different words. Both used a similar variety of strategies with the only difference being Amir using world knowledge more often.
When considering the graduate level participants, Hua noted that when she began her studies, she changed her method of reading to focus on the unknown words in her texts to understand key terms in the field. She mentioned that she had gone through and tried to understand each word as she read silently. The same was the case for Zaira. She read the text carefully and her use of strategies revealed that she used many strategies and focused on rereading and analyzing each word carefully. This method is quite different from that demonstrated by Amir and Ming.

The differences in graduate, undergraduate, and language institute backgrounds reveal that the participants were all approaching the task from different perspectives. The language institute participants were relying heavily on their L1 backgrounds. The undergraduate students were skipping words and attempting to understand the overall idea of the passage. The graduate linguistics students were focused on each individual word and deciphered the meaning of each using an array of linguistic knowledge sources and strategies.

I would hypothesize that one reason for this differentiation is their academic area. I would recommended that future research investigate this theory. If the approach to reading and lexical inference strategies differs by academic area, it would be advisable to offer differentiated instruction in language institutes and emphasizing reading instruction techniques in introductory major courses.
Conclusion

Many topics in the area of lexical inference have been researched in the last few decades. The research into lexical inferencing has a common aim to better understand the mental processing of readers as they struggle to understand new vocabulary terms. Researchers have taken multiple approaches to the study of lexical inference (i.e. investigations into grammatical complexity, strategy use, word knowledge retention and topic familiarity). The focus of the current study was on the effects of both proficiency and L1 background on lexical inference strategy use for L2 English readers. This focus was intended to bring together two areas of research on the topic of lexical inference that had not previously been directly compared. The results were discussed in relation to overall reading strategy use. The study investigated the following questions: 1) Are there patterns in strategy use based on L1 background? 2) Are there patterns in strategy use based on L2 proficiency? 3) Is there a relationship between those two patterns? 4) Are there other variables that influence patterns in strategy use? Six participants from two L1 backgrounds and three levels of proficiency completed a think-aloud task. The results of that task were used to analyze patterns in strategy use.

As would be expected, it appears that in relation to L1 background the top-down and bottom-up reading strategy tendencies relate directly to the lexical inference patterns. In other words, the participants from an L1 background that emphasized top-down reading approaches (e.g. Arabic) would use that same overall approach in their second language (e.g. English). The patterns in proficiency also correlated with the research in the field, which had found that as
proficiency increases, overall strategy use and variety of strategy use increases. The patterns in strategy use based on L1 transfer did not change as proficiency increased; however, while all participants in the study used strategies that were closely related to those common in their L1, their use of those particular strategies increased and other, less common strategies were added depending on the lexical unit and syntactic context. The investigation also noted possible patterns in the inferences based on academic level and area of study of the participants.

The overarching goal of this study was to add to the literature on lexical inference by investigating connections between patterns of influence from L1 transfer and L2 proficiency. By understanding the connection between these two influences, we can better understand the strategies used during of lexical inference in L2 reading, as well as develop methods of instructing learners to increase lexical inference skills. Learners use strategies from L1 transfer as a base for their approach to lexical inference strategy use. Then broaden their strategy use as they develop knowledge within the second language. In a broader sense, understanding how people mentally process reading and vocabulary skills and strategies, reveals how language acquisition works. These findings can add to the vast literature on SLA research in the field of psycholinguists and reading acquisition.

Not only do these findings hold research implications, but they also lead to pedagogical implications. In second language reading classes, both in ESL and EFL settings, there are certain reading strategies and lexical inference strategies that receive emphasis. Based on the findings of this study, it would appear that a combination of strategies most effective. One interesting observation in the analysis of the data was that the participants had certain preferential strategies while there were no particular combination of strategies that led to accuracy from all participants. From this, it can be assumed that strategy use is dependent on the individual skill set
of the language learner. By instructing students on how to use multiple strategies instead of focusing on one or two, and encouraging students to combine strategies, instructors can equip students to improve their lexical inferences as well as reading comprehension.

The study made some valuable findings in relation to SLA research and pedagogical implications; however, there were multiple limitations within this study. Given the small participant pool of the research study, no statistical analyses could be generated, thus the results of the study are descriptions of a single instance that will hopefully lead to further studies on the subject. The variables were confirmed to align with what previous research had found and the comparison of the variables led to only further confirm those previous studies. Another limitation of the current study was that the coding and the accuracy ratings were not confirmed by a third party. In light of this fact, the data and descriptions are at the discretion of the research. In order to validate the data, the coding and ratings would need to be confirmed.

The answer to the fourth research question posed by this study provides a possible area for future study: lexical inference and reading strategies that lead to success in individual academic areas. A recommendation for future research would be to investigate the influence of programs of study as well as level of academic study to see whether reading strategy tendencies differ. If they do differ by one of these two variables, it would be advisable to consider finding which strategies are preferred by which areas of study so that those areas may enhance their introductory courses with reading recommendations. Reading instruction is an area that often focuses on English and British literature and merely skims instruction in how to approach scientific, factual documents, not to mention the many other forms of reading material that are required of students and adults. Offering specialized instruction in these fields would benefit not only non-native but also native English speakers in both their reading and writing within their
given area of study. Research into this area could be approached from the areas of language learning, cognitive research, psychology, and educational practices.

The research into lexical inference strategies as a whole is still an area of focus for SLA and psycholinguistic research. Future studies might take a study similar to this one and offer a longitudinal look at participants from a variety of L1 backgrounds to see if there are any patterns in learning practices and strategy use. It might also be beneficial to compare stated reading strategy use with actual strategy use. Finally, by taking an educational research approach, research could investigate how instructing students in a variety of these approaches with an understanding of the influence of L1 transfer might be beneficial to the English language classroom. Reading strategy use has been researched to an extensive degree, yet scientific inquiry is a continuous process and the application of scientific findings deserves to be tested and revised often. It is only through further investigations that knowledge and educational success in the fields of language learning, psychology, and linguistics can be enhanced.


### Appendix A: Pseudo-Word Table

<table>
<thead>
<tr>
<th>Original</th>
<th>Changes</th>
<th>Pseudo</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>sewage</td>
<td>s --&gt; t</td>
<td>tewage</td>
<td>…have dust between their toes and the smell of ___ in their noses</td>
</tr>
<tr>
<td>treated</td>
<td>g --&gt; p</td>
<td>preated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ea --&gt; ee</td>
<td>preeted</td>
<td>After being ___ by a doctor, we caught the next airplane home.</td>
</tr>
<tr>
<td>waver</td>
<td>w --&gt; n</td>
<td>naaver</td>
<td>When we ourselves become ill, our beliefs ___</td>
</tr>
<tr>
<td>money</td>
<td>m --&gt; z</td>
<td>zoney</td>
<td>… without more ___ for food and clean water to drink…</td>
</tr>
<tr>
<td>contract</td>
<td>c --&gt; s</td>
<td>sontract</td>
<td>… do not ___ some of the serious infectious diseases…</td>
</tr>
<tr>
<td>keen</td>
<td>k --&gt; g</td>
<td>geen</td>
<td>…rather than take such a ___ interest in the curative effect of medicine…</td>
</tr>
<tr>
<td>hazards</td>
<td>h --&gt; d</td>
<td>dazards</td>
<td>… due to ___ in the natural conditions in which we life.</td>
</tr>
</tbody>
</table>
Appendix B: Passage A

Task A

Participant Code: ___-___

Health in the Rich World and in the Poor

An American journalist, Dorothy Thompson, criticizes the rich world’s health programs 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 preeted by a doctor, we caught the next airplane home.

“Now, I believe that the money of the World Health Organization (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 naver. 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 zoney 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 geen 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 dazards 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.”

Adapted from Hastrup (1991, p. 234).
Appendix C: Questions from Questionnaire

### Page #1: Participant Code

1. Type your participant code in the space provided:

### Page #2: Demographic Information

2. What is your native language?
3. How long have you been learning English?
4. What types of English texts do you read on a regular basis? (Check all that apply)
5. What is your gender?
6. What level of academic program are you currently enrolled in?
7. What is your major(s)?
8. How long have you lived in an English speaking country?
9. When do you read English text?

### Page #3: Reading Comprehension (Global Strategies)

10. Think of what you already know about a topic as you read
11. Scan the reading to see what it might be about
12. Notice text features such as tables, italics, etc.
13. Scan a reading and choose specific parts to read closely
14. Use context clues to understand what you are reading
15. Analyze or evaluate what you are reading
16. Check whether you understand what you are reading
17. Predict what will happen, then confirming your prediction

### Page #4: Reading Comprehension (Problem Solving)

18. Read slowly and carefully
19. Read with music, movie, or other noise in the background
20. Focus and slow down if you are reading a difficult or important part
21. Pay close attention to what you are reading
22. Pause and think about what you just read
23. Visualize what you are reading
24. Re-read something you don't understand
25. Guess the meaning of unknown words

### Page #5: Reading Comprehension (Resource Use)

26. Take notes or highlight information
27. Read aloud texts or verbally sound out words or phrases
28. Use a dictionary or translator when you do not know a word
29. Paraphrase what you are reading
30. Ask questions as you are reading
31. Translate from English to your native language
32. Compare how a word or phrase is similar to another word or phrase
33. Skip words or phrases you do not understand
Appendix D: Data Collection Protocol

Task A Researcher Protocol

The task will take place in a room in Bracken Library. Each student will meet with the researcher and be asked to read a passage, conduct a think-aloud where they describe how they define unknown words, summarize the passage in an interview format, and complete a reading comprehension strategy survey. The participants will be given a code when they enter the room. This code will be used to identify the participant without recording any personal identification information.

1. The participant enters the room, and the researcher explains the purpose and requirements of the study. The researcher will also explain the recording procedures. If the participant agrees to participate in the study, they will sign the informed consent form.

2. The researcher will start the recording and then present the passage to be read to the participant. The participant will be asked to scan the passage once and then read the passage aloud. (See Instructions below)

3. While the participant is reading aloud, they will be asked to pause when they come across a word they do not know. There are five words underlined that they will have to stop at to infer the meaning. They will need to infer the meaning of the word and explain both what they think the word might mean and why they think that. During this time, the researcher will dialogue with the participant, prompting them to explain their rationale for word meaning.

4. After the participant has completed reading the passage, the researcher will ask them to answer the following questions: (Not all questions have to be read)
   a. What do you think is the main idea of the passage?
   b. What were some the important details in the passage?
   c. How would you describe the passage to a friend who had not read it?
   d. What do you like/not like about the passage?

5. Once the participant has completed the task, they will be asked complete the survey on the following site: http://www.eSurveysPro.com/Survey.aspx?id=0170f88f-6d74-49a9-bdfa-ed52181c9e96

Task A Instructions

(To be spoken by the researcher)

This is the English text you should read and think-aloud as you read. In the text we have underlined a number of words, the meanings of which you do not know.

Your task is to infer the meaning of the underlined words as well as any other words you do not know. Please say all the suggestions that occur to you. Speak out, even if you are not sure that it is correct. It is important that you come up with a proposal for all the words even when you feel that you are making wild guesses. You have 35 minutes to solve the task.

After you have read the passage and inferred the words, I will ask you a few question about what you have read. This task will be audio recorded for me to listen to later. Only the researchers will listen to this recording.
### TABLE 2

**Definitions and Transcript Examples of Knowledge Sources and Strategies**

**Students Used to Make Lexical Inferences**

<table>
<thead>
<tr>
<th>Knowledge source</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical knowledge</td>
<td>Using knowledge of grammatical functions or syntactic categories, such as verbs, adjectives, or adverbs</td>
<td>&quot;curative effect of medicine.&quot; . . . According to it is adjective . . . mmm . . . it is something before the effect.</td>
</tr>
<tr>
<td>Morphological knowledge</td>
<td>Using knowledge of word formation and word structure, including word derivations, inflections, word stems, suffixes, and prefixes</td>
<td>&quot;unfathomable.&quot; . . . I don't know unfathomable . . . 'un' . . . it is negative of fathomable.</td>
</tr>
<tr>
<td>World knowledge</td>
<td>Using knowledge of the content or the topic that goes beyond what is in the text</td>
<td>I think the &quot;sewage&quot; is like something that is produces, . . . because of some of some illness that these people have, they are talking about some problems that the people have in Africa.</td>
</tr>
<tr>
<td>L1 knowledge</td>
<td>Attempting to figure out the meaning of the new word by translating or finding a similar word in the L1</td>
<td>&quot;assessing . . . . I forgot the idea . . . . Oh I got the meaning . . . . I got it in Chinese, like if I want to apply for position of professional engineer I should pass the the assessment of some organizations like the professional engineering organization.</td>
</tr>
<tr>
<td>Discourse knowledge</td>
<td>Using knowledge about the relation between or within sentences and the devices that make connections between the different parts of the text</td>
<td>&quot;far from being mysterious and unfathomable . . .&quot; unfathomable is like mysterious something that is not known for everybody. Because they are talking about the causes of some disease and they are saying they are mysterious.</td>
</tr>
</tbody>
</table>
### TABLE 2 (Continued)

**Definitions and Transcript Examples of Knowledge Sources and Strategies Students Used to Make Lexical Inferences**

<table>
<thead>
<tr>
<th>Strategies</th>
<th>Definition</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating</td>
<td>Repeating any portion of the text, including the word, the phrase, or the sentence in which the word has occurred</td>
<td>“our beliefs <em>waver</em> . . . waver . . . &quot; May be . . . waver is something “beliefs waver . . . &quot;</td>
</tr>
<tr>
<td>Verifying</td>
<td>Examining the appropriateness of the inferred meaning by checking it against the wider context</td>
<td>“but when we ourselves become ill, our beliefs <em>waver</em> . . . “ our beliefs change . . . change . . . when we become ill our beliefs change . . . yeah.</td>
</tr>
<tr>
<td>Self-inquiry</td>
<td>Asking oneself questions about the text, words, or the meaning already inferred</td>
<td>“<em>hazards</em> . . . “ should it be pollution according to the sentence? “pollutions?” No no . . . it should not be that . . . it may be something different.</td>
</tr>
<tr>
<td>Analyzing</td>
<td>Attempting to figure out the meaning of the word by analyzing it into various parts or components</td>
<td>“and smell of <em>sewage</em> in their noses . . . “ sew, age . . . should be a kind of smell. But sew is something, maybe be it is a kind of plant, wood.</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Showing a conscious awareness of the problem or the ease or difficulty of the task</td>
<td>“<em>contract</em> some of the serious and infectious diseases . . . “ contract . . . I think contract is is make from boss and the staff . . . contract . . . yes . . . this is easy . . . this easy . . . maybe it’s difficult, I am not sure.</td>
</tr>
<tr>
<td>Analogy</td>
<td>Attempting to figure out the meaning of the word based on its sound or form similarity with other words</td>
<td>“<em>squalor</em> . . . “ may be it is like square . . . square . . . It should be something like that.</td>
</tr>
</tbody>
</table>
Appendix G: Revised Think-Aloud Coding Scheme

### Knowledge Sources

<table>
<thead>
<tr>
<th>label</th>
<th>definition</th>
<th>code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grammatical Knowledge</td>
<td>Using knowledge of grammatical functions or syntactic categories, such as verbs, adjectives, or adverbs</td>
<td>GRAM</td>
</tr>
<tr>
<td>Morphological Knowledge</td>
<td>Using knowledge of word formation and word structure, including word derivations, inflections, word stems, suffixes, and prefixes</td>
<td>MOR</td>
</tr>
<tr>
<td>World Knowledge</td>
<td>Using knowledge of the content or the topic that goes beyond what is in the text</td>
<td>WORD</td>
</tr>
<tr>
<td>L1 Knowledge</td>
<td>Attempting to figure out the meaning of the new word by translating or finding a similar word in the L1</td>
<td>L1</td>
</tr>
<tr>
<td>Topic/Theme Knowledge</td>
<td>Using knowledge of the overall theme of the passage and/or knowledge about the topic that the passage is about.</td>
<td>TOP</td>
</tr>
<tr>
<td>Discourse Knowledge</td>
<td>Using knowledge about the relation between or within sentences and the devices that connect parts of the text.</td>
<td>DIS</td>
</tr>
</tbody>
</table>

### Inference Strategies

<table>
<thead>
<tr>
<th>label</th>
<th>definition</th>
<th>code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeating</td>
<td>Repeating any portion of the text including the word, the phrase, or the sentence in which the word has occurred.</td>
<td>RE</td>
</tr>
<tr>
<td>Verifying</td>
<td>Examining the appropriateness of the inferred meaning by checking it against the wider context.</td>
<td>VER</td>
</tr>
<tr>
<td>Self-inquiry</td>
<td>Asking oneself questions about the text, words, or the meaning already inferred.</td>
<td>SI</td>
</tr>
<tr>
<td>Analyzing</td>
<td>Attempting to figure out the meaning of the word by analyzing it into various parts or components.</td>
<td>LYZ</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Showing a conscious awareness of the problem or the ease or difficulty of the task.</td>
<td>MON</td>
</tr>
<tr>
<td>Analogy</td>
<td>Attempting to figure out the meaning of the word based on its sound or form similarity with other words</td>
<td>LOG</td>
</tr>
</tbody>
</table>

### Accuracy Measure

<table>
<thead>
<tr>
<th>label</th>
<th>definition</th>
<th>code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accurate</td>
<td>The inference is the same or a synonym of the original meaning and fits the context of the sentence.</td>
<td>2</td>
</tr>
<tr>
<td>Partially Accurate</td>
<td>The inference is partially accurate and relates to the original meaning.</td>
<td>1</td>
</tr>
<tr>
<td>Incorrect</td>
<td>The inference is completely wrong and does not pertain to the original meaning at all and/or could not be used in the context.</td>
<td>0</td>
</tr>
</tbody>
</table>