AN INVESTIGATION OF NATIVE LANGUAGE VOCABULARY AND TOPIC KNOWLEDGE AS PREDICTORS OF FOREIGN LANGUAGE VOCABULARY LEARNING IN HEALTHCARE PROVIDERS

by

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ABSTRACT

The problem of insufficient foreign language acquisition by professional learners through examination of the roles of native language vocabulary and topic knowledge in adult foreign language acquisition is addressed in this study. Research on the role of lexical equivalents in the learner's native language in foreign language processing, acquisition, and use of target foreign language words is limited and merits further study. Moreover, the concept aspect of vocabulary favors early presentation of the most frequent words in general contexts, professional learners cannot fully profit from previous vocabulary and topic knowledge.

The study of medical Spanish acquisition, due to unusually high levels of representational similarity between English and Spanish medical vocabulary, in addition to unusually deep topic knowledge in the learner population, affords an opportunity to further inform language of specific purpose instruction as well as general foreign language instruction. Medical Spanish is likely more easily acquired than general

Spanish due to an increased percentage of Latin-based words in medical vocabulary, as well as deep topic knowledge of medical vocabulary in medical professionals.

This study investigates the relationship between native English vocabulary size and topic knowledge of adult learners and medical Spanish vocabulary acquisition. Subsequent to completion of the Nelson Denny Vocabulary Test, a medical Spanish test, and an English medical terminology test, forty-four healthcare workers received approximately 12 hours of Medical Spanish vocabulary instruction. Post test scores indicated that by themselves, both medical vocabulary knowledge and English vocabulary skill were significant predictors of Medical Spanish vocabulary acquisition. Medical vocabulary knowledge, however, explained most of the variance in Medical Spanish vocabulary acquisition. The apparent advantage of this study group for concept is congruent with current models of working and long term memory, where highly organized concepts in long term memory free the working memory to attend to and learn new labels in another language, a process not unlike that of expert learning. A curricular shift toward content-centered vocabulary may be warranted for adult foreign language classes

INDEX WORDS: background knowledge, bilingual memory, cognates, content, expertise, foreign language, healthcare language acquisition, languages for specific purposes, LSP, medical Spanish, medical terminology, second language, topic knowledge, vocabulary acquisition

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DEDICATION

To my parents, Dwight Lee and Ila Cheatham Foresee.

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CHAPTER1: PROBLEM

The 21st Century has brought a dramatic growth in demand for foreign language courses for specific professional groups. Over thirty percent of hiring managers planned to increase hiring of bilingual businessmen, engineers, and medical personnel in 2006 (Lorenz, 2006). A strong indication of the need for employees to speak another language on a professional basis, companies often offer bonuses to employees who demonstrate proficiency in a foreign language (Engineering News, 1999).

Traditionally, we have looked to academia to train and evaluate speakers of foreign languages. The problem is that academia has traditionally not done a very good job in training the populace to communicate in foreign languages (Jenkins, 2006). A recent Modern Language Association Report, recognizing the need to produce graduates "better able to function in an increasingly global environment" called for a change in the current structure of the university foreign language department that "devalues the early years of language learning and impedes the development of a unified language and content curriculum"(The Chronicle of Higher Education, 2007). The need for foreign language instruction that is not general in nature is evidenced in professional areas as engineering and medicine. In a study of the needs of engineering students at the University of Berlin, it was found that a good general knowledge of the target language did not necessarily enable engineering graduates to use the foreign language in specific areas key to the specialty (Dlaska, 1997). Respondents reported that they were not able to communicate adequately to accomplish basic tasks key to their specialty with a general

foreign language background. Doctors have also found that general Spanish knowledge does not always equip them for communication with their patients (Burbano-O'Leary, Federico & Hampers, 2003).

Such a need has motivated the top ten American research and primary care medical schools to offer Medical Spanish courses or to make them available as continuing education. Only three healthcare institutions have been found to have documented focused training in medical Spanish (Binder, Nelson, Smith, Glass, Haynes, & Wainscott. 1988; Prince & Nelson., 1995; York-Frasier, Davalos, Nusbaum, & Skinner 2005). Among these, the York-Frasier et al. study describes a mini-immersion course for 8 family practice interns that included Spanish pretests and posttests. A highly significant difference was found between the pretests and posttests, but the analyses were not described or included in the publication. The Binder et al. study describes a 45-hour course for students of emergency medicine. Although it claims to have produced "functionally bilingual" doctors who communicate sufficiently well to reduce translation assistance from nurses and clerical staff, the results were ascertained through post-course interviews and instructor assessment only. In sum, as the area of foreign language learning for professional purposes is relatively new, approaches to maximize acquisition of language for specific purposes have not yet been fully described.

Language for specific purposes (LSP) instruction has its root in the need to evaluate professional and language abilities of foreign nationals, especially in professions where there is a paucity of native professionals (Douglas, 2001). One of the first tests designed for such a purpose was the UK's Temporary Registration Assessment Based Examination (1975) for physicians (Rea-Dickens, 1987). Medical specialists and

linguists worked to assure that both background knowledge and language knowledge were being tested. Subsequent tests as Australia's OET (Occupational English Test) for physicians (Douglas, 2001) were later constructed for a similar purpose. Although the test still exists, cohorts of the foreign doctors who passed the exam have questioned the usefulness of the exam noting that many times successful foreign candidates do not perform their professional duties adequately (Douglas, 2000). Accordingly, it follows that the abilities required of a professional functioning in a foreign language must be better understood to maximize foreign language acquisition for specific purposes.

The traditional methods of foreign language instruction may not be those most suited to healthcare providers. As science and math majors have been shown to score significantly higher on the verbal portions of college entrance examinations in their native language than most other majors (College Entrance Examination Board National Report, 1993), it is surprising that they have been shown to profit less than most majors from traditional foreign language instruction (Cooper, 1987). If science majors (who are more likely to end up in medical settings than other majors) do, in fact, find traditional foreign language learning difficult, non-traditional methods of learning should be explored and the cognitive skills necessary for optimal foreign language learning in this group need to be identified.

Recent Research in Foreign Language Acquisition

Foreign language vocabulary acquisition involves phonology and its conversion to lexicon. Current models of vocabulary acquisition involve a phonological loop in working memory that temporarily stores unfamiliar sound structures. These temporary stores are eventually placed in more permanent memory representations (Baddeley,

Gathercole, & Papagno, 1998). As the learner increases his foreign language vocabulary knowledge, the vocabulary base itself may facilitate the learning of new words, thus decreasing dependence on the phonological loop. Work by Speciale, Ellis, and Bywater (2004) indicates that both short-term memory and existing lexical knowledge contribute to new word acquisition. This suggests that a large vocabulary is more likely to facilitate learning (Gathercole & Baddeley, 1993).

The strength of the vocabulary has been characterized by the continuums of quantity and quality, which both affect foreign language proficiency (Nation, 2001). Vocabulary breadth, more related to quantity or size, may enhance both comprehension (Laufer, 1992) and additional vocabulary acquisition (Gathercole & Baddeley, 1993). Vocabulary depth, more related to quality or degree of difficulty, has been found to affect language acquisition as it relates to concept formation (Flood & West, 1950). The quality of vocabulary is often measured in terms of receptive and productive vocabulary. Receptive vocabulary (i.e., vocabulary that is understood) is considered to require less knowledge than productive vocabulary (i.e., vocabulary whose meanings that must be retrieved from long-term memory), considered to emanate from better organization, requires the learner to initiate communication (Schmitt & McCarthy, 2005). Thus, better quality and quantity of vocabulary (generally well organized) are characteristics of vocabulary base that impact to a large extent, foreign language proficiency.

Cummins' Linguistic Coding Differences Hypothesis (1981) states that native language greatly influences a second language. He formed his hypothesis after noting that elementary school bilingual children learned English only as well as they knew their native language. Since then, interest in the relationship between the first and second

languages has been studied in diverse groups, including adults. While a few have brought modifications to Cummins' hypothesis applicability, it is now agreed that native language is the foundation upon which the second language is built. Therefore, second language researchers have investigated those factors that contribute to native language acquisition and have found them to hold true for second language acquisition (de Bot, Lowie, & Verspoor, 2005; Nation, 2001).

One way in which native language facilitates second language vocabulary acquisition is through perception of word forms. The process of acquiring vocabulary through word form entails perceiving and packaging those symbols and sounds similar to those of the native language and linking them to their equivalents in long term memory. Gathercole and Baddeley (1993) have suggested that a large vocabulary would enhance phonological skill by increasing the number of approximations to unfamiliar words in memory. An explanation for this may be that large native vocabularies in languages as English include loan or root words which are written or pronounced in a similar enough manner as to aid acquisition of a second language vocabulary. Thus, increased volume of word representations offered by orthographic and phonologic exemplars in the native language may explain, to a certain extent, foreign language competence.

However, the formal representation of the components of a vocabulary base does not completely explain how native language facilitates second language acquisition. An increase in vocabulary in second language acquisition is also likely related to concept formation. The learner's first language may influence the second language by identifying those words possessing conceptual equivalents already in long-term memory and storing the new versions in the same or adjacent to the native concept cell. Indeed, recent models

of bilingual memory posit that words in both languages are located in a shared conceptual memory (Kroll & de Groot, 1997). In such a model, it is predicted that vocabulary development in a second language would be more efficient for concepts already created in the native language. Thus, acquisition of a new second language word would simply involve re-labeling rather than constructing new concepts. In sum, native vocabulary facilitates second language acquisition by circumventing the need for concept formation.

Topic knowledge has also been shown to aid in foreign language acquisition. Just as the concept represented by a word form facilitates foreign language learning, so may the organized product of multiple concept relationships, topic knowledge. It is thought that the mere re-labeling of an established concept frees the learner to acquire the spoken or written form of the word more easily. Indeed, a study by Clapham (1996) has indicated that university students learn a foreign language faster in the area of their expertise. Therefore, that deep well of conceptual representation, topic knowledge, may be another route of facilitating second language vocabulary acquisition.

Language for Specific Purposes

Second language didactics are only partially applicable to learners of language for a specific purpose. General foreign language instruction has not sufficiently addressed the unique nature of specific purpose learners and their exact curricular needs. Specific purpose language learners (LSP) are distinct in their need for sub-technical and low frequency vocabulary and their depth of content knowledge in a specific realm. Second language learning traditionally covers a broad curriculum, characterized by the use of high frequency words applicable to general communications. Therefore, in general foreign language classrooms, because frequent words are the early focus of instruction,

only in the most advanced learners could possess a second language proficiency that would be adequate in professional endeavors.

Further, while traditional foreign language instruction does not provide appropriate vocabulary for learners for specific purposes, it has also ignored the relative benefits of vocabulary concept knowledge and related topic knowledge which distinguished the special purposes learner. Background knowledge and concept understanding in specific content areas may, in certain groups of learners, represent a facilitating factor in second language learning. This advantage of accessing the conceptual nature of words and related topic knowledge instead of the form of the word has been supported by Ganschow, Sparks, Javorsky, Pohlman, and Bishop-Marbury (1991) who observed that adults who are poor foreign language learners (likely due to poor short term phonological memory) access semantic representations of target words in their knowledge base to aid in foreign language acquisition. Further, Lin (2003) has observed that the understanding of technical words facilitates English acquisition in Chinese university students whose language possessed little phonological overlap with English. Thus, both specific vocabulary knowledge and topic knowledge may be helpful and needed to expeditiously acquire a second language for specific purposes.

The study of Medical Spanish acquisition provides an opportunity to extend knowledge of the efficiency in processes of general foreign language learning and specific purposes language learning via exploration of unique vocabulary and learner characteristics. Medical Spanish form and content are easy for the native English speaker. Additionally, the learner is a medical professional; he possesses significant topic knowledge in his native memory to facilitate rapid acquisition of Medical Spanish.

The vocabulary used in medical communications, is very similar in English and Spanish being Latin-based. Second, the medical concepts that the word forms represent are well organized in the native language vocabulary base of medical professionals, and, to a great extent must only be relabeled instead of constructed. Therefore, Medical Spanish learners showcase substantial advantages in foreign language acquisition.

Proposed Study

The proposed study will confront the problem of insufficient foreign language acquisition by professional (LSP) learners through examination of the roles of native language vocabulary and topic knowledge in adult foreign language acquisition. Research on the role of lexical equivalents in the learner's native language in foreign language processing, acquisition, and use of target foreign language words is sparse (Ganschow & Sparks, 2001; Paribakht, 2005). The role of a shared native and foreign vocabulary base in subsequent vocabulary acquisition studies must be extended. Native and foreign languages are learned initially by accumulation of vocabulary that in turn creates patterns by which additional vocabulary is learned, with previously acquired vocabulary facilitating early language learning. Therefore, elements of a second language vocabulary that are sufficiently similar to the native language may be treated as if they were part of the foreign language vocabulary base. That is to say, the effective extending of the vocabulary base may facilitate second language learning. This perception of sameness of the two vocabularies is not unreasonable. As 76% of scientific English content words have been shown to be Spanish cognates (words similar in form and/or sound (Bravo, Hiebert, & Pearson, 2007) and could perhaps be easily integrated with the native vocabulary base. I therefore posit that, in scientific communications,

early Spanish acquisition may be helped by the phonologically similar native language (English) vocabulary.

In contrast to the role of native language in second language vocabulary acquisition, the concept aspect of vocabulary and related topic knowledge has not been well recognized in second language acquisition. The focus of foreign language curricula has been toward presenting the most frequently used words in general academic contexts first. What is really needed is a presentation of those words most frequent in the specific *topic area* (Nation, 2001). A learner centered focus of curricula would capitalize on the deep conceptual advantage of medical topic knowledge. Vocabulary most often associated with the medical profession, which carries the added advantage of numerous English-Spanish cognates, can be presented first to establish an early vocabulary base in the second language. These technical and semi-technical words are generally critical to comprehension in healthcare and other professional scenarios. In this way, learners are afforded the opportunity to develop comprehension skills by applying their background knowledge to vocabulary knowledge in professional scenarios. Therefore, medical Spanish learners, by virtue of the concept advantage provided by professional topic knowledge, may be more likely to have facilitated medical Spanish vocabulary acquisition.

The study of medical Spanish acquisition, due to unusually high levels of representational similarity between English and Spanish medical vocabulary, as well as unusually deep topic knowledge in the learner population, affords an opportunity to further inform not only language of specific purposes instruction, but also, perhaps, general foreign language instruction. It is not known to what extent native language

vocabulary informs foreign language vocabulary acquisition. Further, no studies of the effect of topic knowledge on foreign language vocabulary acquisition have been found. Medical Spanish is likely more easily acquired than general Spanish because in the topic of medicine contains a high percentage of the vocabulary in English being Latin-based and vocabulary can be built up rapidly. It is also possible that deep background knowledge in medical professionals can substitute for vocabulary in Spanish comprehension. The advantages for traditional classrooms lay in future insights into vocabulary selection and the development of learner targeted methods of vocabulary acquisition. In the past, curricula have included vocabularies that have hampered vocabulary building by favoring frequency lists over useful words which are easy to learn. Additionally they may have discouraged those learners with short term phonological memories by failing to offer them an alternative route for vocabulary building through enlisting easily accessible native vocabulary. Thus, if a highly significant correlation can be found between native language (English) vocabulary size, topic knowledge and Spanish vocabulary acquisition in healthcare workers, more consideration of alternative methods of vocabulary acquisition in all foreign language instructional settings may occur. Accordingly, the questions that will be investigated are:

1. Is there a relationship between the vocabulary size of the adult learner whose native language is English and his ability to acquire beginning medical Spanish vocabulary?
2. Is there a relationship between the topic knowledge of an English-speaking healthcare professional and his ability to acquire beginning medical Spanish vocabulary?

3. In learning medical Spanish, is topic knowledge or native language vocabulary more important? Do the two interact to produce better medical Spanish vocabulary learning?

CHAPTER 2: REVIEW OF THE LITERATURE

All words are pegs to hang ideas on.

Henry Ward Beecher

Foreign language learners who need to communicate in a specific domain more quickly than that afforded by traditional instruction would do well to examine research literature on language acquisition. When the workhorse of language, the word, is understood, the whole of language will follow. However, when we consider the issue of language learning for specific purposes, it immediately comes to mind to question the inverse idea based on the quote proposed above: Are all ideas pegs to hang words on?

Communication through language is most indebted to vocabulary. While language is an amalgam of vocabulary and grammar (Lewis, 1997), vocabulary is central to language and is of utmost importance to the typical language learner (Coady & Huckin, 1997). Early investigations of native reading comprehension skill (Thorndike, 1917) have pointed to its close relationship with vocabulary. Oral comprehension, while less well studied (De Bot, Lowie, & Verspoor, 2005) appears to depend also on word knowledge (Tanenhaus, Spivey-Knowlton, Eberhard, & Sedivy, 1995; Thierry, Vihman, & Roberts, 2003). Thus the ability to communicate orally and through writing depends upon vocabulary.

To form a backdrop for the present study I first will explore how vocabulary is acquired and represented in memory. Second, I focus on a key topic that relates to language for specific purposes, topic knowledge and expertise and their relation to

general vocabulary knowledge. Third, I describe the known relationships between native language vocabulary skill and second language acquisition, describing the particular relationships to second language vocabulary. Then, I will explore the influence of topic knowledge and expertise on second language vocabulary acquisition, which relates to the issue of Language for Specific Purposes. Finally, I will discuss the need for a study on Medical Spanish vocabulary acquisition as an exemplar of Language for Specific Purposes.

How Vocabulary Is Acquired, Represented, and Organized in Memory

For vocabulary to be remembered, it must first be processed in short term memory, followed by storage in long term memory. Moreover, once in long term memory, there are varying degrees of interconnection and depth of vocabulary knowledge. I will describe each of these issues in turn.

Levelt (1989) proposed a speech processing model in short term memory that divides vocabulary (the lexicon) into units of meaning (lemmas) and phonological forms. He conceptualized the lemma as semantic and grammatical knowledge with words carrying multiple meanings with differing suffixes or prefixes being conceptualized separately. Current models of basic reading and speech perception have been presented by Coltheart, Curtis, Atkins, and Haller, (1993); Seidenberg and McClelland (1989), Plaut, McClelland, Seidenberg, & Patterson (1996); and Masson and Borowsky (1998) with a hybrid connectionist dual-route model being offered by Zorzi, Houghton, and Buttersworth (1998). Coltheart et al.'s dual processing model presents a feed forward mapping of print onto orthographic lexical representations followed by attachment to semantic representations. In this model, speech is separately converted to phonological

lexical representations and finally to semantic representations. One route to long term memory may be conceived as a sight vocabulary route and the other as phonetic decoding route (Borowsky & Owen, 1999). Whatever the short-term memory route followed, representation of the word in long term memory is the ultimate goal.

The Role of Working/Short Term Memory. Short term phonological memory is extremely important to foreign language acquisition. The ability to segment speech into discrete sound segments and words is an important precursor to vocabulary acquisition that is useful to both infants and adults. This lexical parsing is accomplished only after phonological regularities of a language have been perceived (Brent, 1999, Elman, 1990, Jusczyk & Hohne, 1997; Speciale, Ellis, & Bywater, 2004). The working memory model proposed by Baddeley and Hitch (1974) suggests that short-term memory is responsible for temporary storage and manipulation of speech. This consists of the phonological store for input and the phonological loop which can refresh contents of the store. Those individuals able to learn the phonological regularities or sequences of language and subsequently store them in long term memory are believed to be the most successful native and foreign language learners (Speciale et al., 2004). Thus, short term memory must be employed to acquire a language.

This perception of patterns and their entry into short term memory is particularly important in early vocabulary acquisition. The association between the phonological loop capacity of short term memory and vocabulary knowledge, independent of nonverbal intelligence, is significant (Gathercole & Thorn, 1998). Service (1992) in a study of Finnish school children aged nine to ten found that earlier ability to repeat nonsense syllables was highly correlated to vocabulary scores. Similarly, studies of

learning disabled individuals have found that individuals with general conceptual learning deficits can possess phonological capacities well within the normal range (Vallar & Papagno, 1993). It is no wonder that tests to access foreign language learning ability are heavily tilted toward the ability to process the patterns found in a language's sounds and symbols (Carroll & Sapone, 1959).

The Role of Storage and Long-Term Memory. Language learning proceeds according to the learner's stage of learning. Although the more successful language learners appear to have a proclivity for parsing words, an alternative route which has been little studied until recently exists for acquiring vocabulary. Native and foreign language learners have been shown to rely more heavily on established vocabulary than on short term phonological memory after a certain vocabulary threshold has been reached. Once a vocabulary base has been initiated, individuals may access long term memory for templates for further vocabulary acquisition. Thus, learners profit more from vocabulary according to their stage of language acquisition.

The Interface of Short Term and Long Term Memory. After an initial stage of acquisition, the language learner may use both short and long term memory to accumulate more words. The mechanism whereby existing vocabulary is accessed to comprehend language has been reported to be similar to the pattern-selecting abilities of infants (Nation, 2001). That is, a word is now predicted on the basis of a statistical probability established by the previously-acquired vocabulary base (Thorn & Gathercole, 1998). It is postulated that the ability to use old vocabulary to learn new words is the process by which those speakers who are poor decoders circumvent using faulty phonological memory and eventually learn vocabulary (Gathercole, Willis, Emslie, &

Baddeley, 1992). However, as Thorn and Gathercole (c.f: Healy & Bourne, 1998) have pointed out, because this probability is based on the specific forms or structures established in the native language, this process may be less efficient in foreign language learners. Thus, according to the learner's need, he may access short term, or long term memory to acquire more vocabulary. Which avenue he employs will depend in great part upon his ability to process speech or print through the phonology of short term memory, and by language experience, as determined by the amount and accessibility of vocabulary words already stored in long-term memory. The short-term route is form-based and relies heavily on sound initiated perception and parsing, a bottom-up in orientation. The long-term route appears to begin in semantic stores from which phonological patterns are extracted, with a top-down orientation (Barcroft, 2007; Capone & McGregor, 2005). Thus, new vocabulary may be acquired in two ways: through accessing the referent linked to a whole word or at least significant parts of a word (through pattern recognition), or by processing phonology and creating a new representation by perception of patterns of sounds in speech linked to a meaning.

Vocabulary then may be perceived to exist in memory as labeled concepts that exist in relation to other concepts. The ability to use vocabulary is not only dependent upon the characteristics of each word, but also upon its relationship to other words, or language as a whole. The strength of representations of words as well as their number, organization and interrelations, are extremely important when assessing how a language may be acquired.

Dimensions of Vocabulary Organization. Vocabulary is said to be organized along a variety of dimensions, particularly strength and size. I will discuss each of these in turn.

One key organizational feature of vocabulary is vocabulary strength. One reason that new learners of second languages can't communicate easily is due to lack of vocabulary strength, which can be generally aligned with the receptive/productive dimension of vocabulary (Nation, 2001). The dimension of vocabulary strength is important by virtue of how a word relates to vocabulary base. Strength has been characterized in four major ways, all addressing the general classification of receptive and productive vocabulary. A cursory explanation of the difference between receptive and productive vocabulary describes receptive vocabulary as perception of the sound or symbols of word form as in listening or reading as contrasted with productive vocabulary, the expression of meaning as in writing and speaking. Receptive vocabulary is, in general, associated with weaker knowledge representations than is productive vocabulary. This element of strength was described by researchers in memory modeling in terms of stage of language acquisition. Carey & Bartlett (1978) suggested that a new word that has fewer or weaker links to other words in the vocabulary base and is thus is more difficult to remember would be considered receptive vocabulary. A second way in which receptive and productive vocabulary were distinguished was in direction of knowledge access (Rohde & Tiefenthal, 2000). That is, receptive vocabulary, often novel vocabulary, is evoked by external stimuli, often the spoken or written word, whereas productive vocabulary is generated internally from an established knowledge base, in an attempt to carry meaning to written or spoken speech.

This concept implies a contrast between weak surface features and deep, meaningful concepts of words. Third, the distinction between receptive and productive vocabulary has sometimes been described in terms of how recently and frequently the vocabulary base as been accessed, implying that the passage of time decreases vocabulary strength (Coady & Huckin, 1997). Last, the distinction has been perceived in terms strength by virtue of quantity of knowledge acquired. This knowledge has been characterized not only by the size of the vocabulary base, but also by the depth of long term memory developed with greater organization brought by rich elaboration and associations (Melka, c.f.: Schmitt & McCarthy, 2005). In sum, the receptive-productive distinction lies in strength of knowledge characteristics related to a word's relationship to vocabulary base.

A second dimension of vocabulary organization is vocabulary size. It has often been noted that it is impossible to communicate in a foreign language due to lack of sufficient foreign language vocabulary. While it is helpful to know the total number of words understood, it is not always helpful, as some words are more useful than others depending upon the needs of the speaker. Further, the extent to which words are known, including how words are stored in relation to others may also determine how useful they are to memory, and thus to communication.

One contributor to vocabulary size is breadth of vocabulary, the number of words of which one possesses some mental representation in long term memory. Vocabulary size is a major determinant of language acquisition. While a large vocabulary generally indicates a wide range of experience and knowledge of the word, it is possible that it merely indicates that a learner has learned the prototypical concept associated with the

word, but not the range of exemplars to which the term applies (Nation, 2001). It is also true that the specific nature of a word, or its coverage of concepts may be more important in producing and understanding communications than mere number of words known. However, the number of words in a vocabulary does count, as it has been shown that after a certain threshold of vocabulary has been reached that a type of reorganization must occur creating vocabulary depth (Mills, Plunkett, Prat, & Schafer, 2005). It follows then that memory and the ensuing language acquisition is affected by the breadth and subsequent organization of the resultant vocabulary base.

Another contributor to vocabulary size is vocabulary depth. Communication especially that associated with professional or academic pursuits requires a deep, highly organized vocabulary base. Some researchers have characterized depth of vocabulary knowledge as a continuum from very little to full understanding (Baumann & Kameenui, 1991). Others, as Anderson and Nagy (1981), have posited that deep knowledge includes both understanding of a word's critical features of meaning as well as the context of the word. A study by Swanson, Cooney, and O'Shaughnessey (1998) among students with and without learning disabilities corroborates this model. It was found that learning disabled students had a few loosely-linked word features associated with their vocabulary while those not learning disabled possessed vocabularies with several well-linked features associated with deep vocabularies. Further, N. Ellis (1994) asserts that to develop this deepness of vocabulary, to develop an understanding of critical vocabulary features, the learner must experience a word in a variety of scenarios. A study by Lorsbach and Gray (1985) in second grade and sixth grade students with and without learning disabilities found that learning disabled students selected visual stimuli over

acoustic and semantically linked vocabulary features, while non-learning disabled sixth graders selected semantic or conceptual features in identifying vocabulary. This was taken to indicate that deeper vocabulary bases find an advantage of semantics or meaning in acquiring vocabulary whereas less deep or undeveloped memory systems must use other cues to acquire vocabulary. Therefore, an understanding of critical features of a word closely linked to the contexts in which it occurs is required to produce a depth of vocabulary knowledge. Indeed, a deep vocabulary is an elegant amalgam of the concepts and the body of knowledge associated with specific words.

Of course, people and children tend to have fairly shallow organization outside of their areas of expertise. In what follows, I describe the relationship between expertise and vocabulary.

Topic Knowledge and Expertise

Depth of vocabulary knowledge is prerequisite to topic knowledge (Bedard & Chi, 1992). For example, it is not unusual in a beginning science course for teachers to instruct the vocabulary in an area to promote understanding of topic knowledge. In learning vocabulary, words carry with them phonology, orthography, and conceptual meaning. A specific concept is delineated in identifying those critical features that make each word unique. In addition to the convergence of specific semantic features, each word is situated in an organized vocabulary base. The conceptual schema in which the word is positioned will be influenced by related word schemas, which together constitute background or topic knowledge (Bedard & Chi, 1992). While a disorganized conceptual schema will impede word retrieval (Crutcher, c.f. Healy & Bourne, 1998), related schemas of associated words will facilitate retrieval (Baddeley, 1990). Thus, not only the

semantic content of the word itself, but topically related words influence how that word is learned.

The exact nature of the relationship between topic knowledge and native vocabulary was studied by DeMarie, Aloise-Young, Prideaux, Muransky-Doran, & Gerda (2004) in undergraduate education and business majors. Students were asked to recall three lists of 20 general, education, and business terms. They were then categorized according to the number of courses completed in one of three majors. Until a plateau number of courses was attained, greater number of courses taken predicted vocabulary recall in the students' major, but not in the other two majors. One important implication of this finding is that topic knowledge may be an important contributor to the acquisition of a language vocabulary, but perhaps only to a certain threshold.

As suggested by DeMarie et al.'s study, there appears to be a continuum of topic knowledge. It proceeds from vocabulary concept through deep vocabulary organization, expanding to topic knowledge and eventually developing into expertise. As new information is taken into the vocabulary base, its patterns are reorganized, vertically and horizontally, producing elongated chunks of patterns with more associations of related information with the development of topic knowledge (Bedard & Chi, 1992) Further, it is believed that there is a progression toward stronger links among concepts as the learner approaches expertise (Nation, 2001). Therefore, the learner's stage of development in this continuum may determine to what extent new input will affect his personal success in vocabulary acquisition.

A large organized domain knowledge is prerequisite to real expertise (Bedard & Chi, 1992). It follows then that a consequence of extended successful learning is the

development of expertise. Experts are not distinguished from novices merely by memory, intelligence or strategies, they think differently. Expert learners, whose knowledge base has been structured and deepened by experience as those who have practiced a profession for an extended period of time, tend to approach problems in a familiar domain by organizing, representing, and interpreting information differently than novices. These differences affect how they remember, reason, and solve problems (Bransford, Brown, & Cocking, 2003). It is no surprise that researchers have chosen word knowledge as an indication of expertise (Johnston, 1984).

Cognitive science research has indicated a number of ways in which expert knowledge may be distinguished from that of novices. First, the patterns of knowledge represented as chunks in expert memory, tend to be correlated with greater organization, and are more numerous than those of novices (Bedard & Chi, 1992). The process of chunking in short term memory is accomplished by matching segments of information to functions or strategies that are already embedded in the expert's hierarchical, highly organized knowledge base (Bransford, Brown, & Cocking, 2003). Second, these patterns are cross referenced with stronger and more numerous links to networks of connections among concepts than those of novices or those with some topic knowledge (Bedard & Chi, 1992). Third, as a result of better and more numerous connections, the expert knowledge is more closely linked to the meaning or principles of vocabulary of a particular domain, whereas novice knowledge tends to proceed from surface, literal or prototypical feature knowledge (Bedard & Chi, 1992, Bransford et al., 2003). Consequently, expert knowledge does things that novice and cursory topic knowledge cannot do. Expert knowledge is characterized by the ability to infer solutions when

information is disorganized or lacking (Bedard & Chi, 1992). The structure of expert knowledge influences perceptual processes and strategies due to its superior ability to notice patterns and connections. It does this by effectively filtering out non-relevant input information (Bedard & Chi, 1992). Accordingly, this efficient organizational structure of expert knowledge bases provides quicker and more automatic informational accessibility and retrievability (Bransford et al., 2003), freeing the thinker to produce higher quality reasoning (Schneider & Shiffrin, 1985).

In sum, the progression of a novice toward expertise is one that gradually relieves the learning burden thanks to a highly efficient knowledge base, progressing toward automaticity, allowing experts in a domain to effortlessly process information without requiring excessive conscious attention. The expert's instant availability of resources allows him to be almost automatic in his ability to retrieve or infer information (Bedard & Chi, 1992).

Expert vocabulary knowledge, then, is characterized as knowledge specific to the domain, which is attained after extensive experience or practice (Nation, 2001). These are words that can only be completely understood by studying the field or domain in which they occur (Douglas, 2000). This may be explained by the fact that the number of features which are involved in their meaning are such that only repeated and varied exposure to the domain can organize the meaning that they represent. It is also probable that as one proceeds toward expert knowledge of a domain, that the meaning of the most critical vocabulary is so specific, that only those individuals most involved in the enterprise or profession would bother to learn the terms. Not surprisingly, linguists have

not been quick to recommend the inclusion of highly specific vocabulary in foreign language curricula, as it is rarely part of the instructor's conceptual base (Nation, 2001).

The Relationship of Native Vocabulary Skills to General Second Language Acquisition

A language learner who wishes to acquire a second language quickly can profit from what is already established in his native language. The importance of native language to acquisition of a second language was brought to the foreground in Cummins' study of bilingual elementary school children. In his Linguistic Interdependence Hypotheses (1981), he posited that it is through initial native language competence that development of second language competence is possible. Although Cummins cited studies of bilingual children learning English, the influence of native language in adult and adolescent learners has been affirmed in several studies (Han & Ellis, 1998, Sparks, Ganschow, Patton, Artzer, Siebenhar, & Plagenan., 1997). There is, in all groups of learners, an indication that the status of native language impacts future success in second language. Thus, there is general consensus among second language researchers that those factors that influence native language acquisition will similarly impact learning in the second language. It is believed that native language influences second language acquisition through two major avenues: (a) native language knowledge of the phonological characteristics of the word form; and (b) through common meaning content.

The initial area of first language influence on learning a second language is phonological, chiefly through the ability to perceive and package those symbols and sounds similar to the native language and link them to their equivalents in long term memory (Papagno, Valentine & Baddeley, 1991). Specifically, as in early acquisition of the native language, the most pronounceable words, those heard most frequently, and perceived as most important for personal communication are selected first, the same is

true for learning the second language (Ellis, 1999). Service (1992), in studying Finnish school children, found that their ability to repeat nonsense words modeled after their native language predicted their English vocabulary. Durgunoglu, Nagy, and Hancin-Bhatt (1993), in studying the decoding aspect (either written or oral) of vocabulary, found that native Spanish-speaking first grade students classified as better decoders in Spanish (a phonological aspect of vocabulary knowledge), were also better at decoding English. In a study by Meschyan and Hernandez (2002), native English decoding skills predicted second language competence mediated by second language decoding capacity in university students enrolled in beginning Spanish. Similarly, Lindsey, Manis, & Bailey (2003) found in a sample of Spanish-speaking English language learners, that phonological awareness transferred from Spanish to English and was also predictive of word identification skills. Therefore, it appears that in beginning foreign language learners that phonology, specifically the decoding aspect of vocabulary acquisition, is related to that ability in the native language.

A second influence of first language on the second language vocabulary acquisition is the possession of common semantic content which allows one to identify those words which possess conceptual equivalents already established in long-term memory. The facilitating effect on second language vocabulary acquisition has been attributed to shared storage in long-term memory. The second language version is stored in the same concept cell as the native vocabulary equivalent or immediately adjacent to that cell affording economies of time and effort in language acquisition (Kroll & de Groot, 1997). This appears to afford an advantage for adult foreign language learners, as they do not need to expend much effort on organizing the conceptual component of new

vocabulary in memory. A further advantage of the established native vocabulary for linguistically related languages may be that it can expedite the entry of certain words which are similar in form and meaning (cognates) into the vocabulary base. Thus, as in native vocabulary acquisition, the establishment of a sufficient vocabulary base in the second language allows the learner to initiate communication by accessing long term memory for the meaning or concept; then attaching it to appropriate phonology or orthography before communicating (Ouelette, 2006).

Here is some research that indicates the facilitative effect of first language vocabulary on second language acquisition in general. Proctor, August, Carlo, & Snow (2006), in studying English reading comprehension in 135 Spanish-English bilingual fourth grade students, found faster English reading by those children who had more Spanish vocabulary knowledge. The study, which controlled for language of instruction, English decoding (phonology) skill, and English oral language proficiency, found a significant main effect for Spanish vocabulary knowledge itself and an interaction between Spanish (native) vocabulary and English fluency. A study by Sparks et al. (1997) of 60 first year foreign language high school students found that a measure of phonology-orthography employed in the Modern Language Aptitude Test (MLAT), and first year foreign language grade were the best overall predictors of second language proficiency. However, in second year foreign language study, native language vocabulary as assessed by the Peabody Picture Vocabulary Test was also a significant predictor, actually a better predictor of overall proficiency than the MLAT. It is clear, then, that native language vocabulary itself contributes to foreign language acquisition.

Of course, native language vocabulary may not have as much of a facilitative effect when the two languages are linguistically distinct. Kahn-Horwitz, Shimron, and Sparks (2005) evaluated the influence of vocabulary from a non-similar native language and second language on second language reading. Fourth grade Hebrew learners of English who were lower on general language ability, but not on semantic ability were studied. Students considered weak English readers, determined through low English word reading scores and low comprehension scores, were given two 12 item antonym and synonym tests of Hebrew words and two receptive English vocabulary tests. The authors found that both English and Hebrew vocabulary knowledge were part of the model differentiating weak from strong English readers. Strong Hebrew word reading differentiated between strong and weak English readers. Further, phonological knowledge, word reading, Hebrew vocabulary and English vocabulary were all predictors of second language reading ability. Thus, in evaluating which aspect of Hebrew (native) vocabulary influences English reading ability most, it must be surmised that it is the meaning or concept in these phonologically dissimilar languages.

The Relationship of Native Vocabulary to Second Language Vocabulary Acquisition

While many studies highlight the effect of native vocabulary on foreign language proficiency, few on the effect of *native vocabulary* on *foreign vocabulary* have been published. One such vocabulary study is that of Masoura and Gathercole (1999) who studied ten-year-old Greek public school children who had studied English for one to five years. Students were asked to produce oral English responses to words in Greek and vice versa. Their initial finding was that the children's phonological memory skills as assessed by nonword repetition accuracy were highly related to their vocabulary

knowledge of both languages. The relationship between short-term memory and English vocabulary was found to be independent of more general factors as age, nonverbal ability and length of time spent learning English. However, once native language nonword repetition ability was accounted for, acquisition of foreign language vocabulary was associated with vocabulary competence in Greek. Thus, the Greek school study points to the semantic portion of native vocabulary as an influence in the acquisition of second language vocabulary.

Native English vocabulary is not always the quickest route to second vocabulary acquisition. Word conceptual information related to the native language vocabulary may come into play in more advanced second language learners as they acquire second language facility. Kroll and Stewart (1994) found that American university students learning Dutch vocabulary performed significantly better on vocabulary recall if the vocabulary was linked to pictures (conceptual knowledge) rather than to the English equivalent only after an initial period of learning. Initial exposure to written Dutch words was more closely linked to their written representation in English. Kroll, Michael, & Sankaranarayanan (1998) have postulated that the likely reason conceptual information is more important to learners with some prior experience in the target language, is that there are strengthened connections between the target language and the word concept acquired by previous experience. They argue that, in early second language acquisition, the word concept to second language connection can only be accessed through a strong native language connection (see also, Dufour & Kroll, 1995).

The Influence of Topic Knowledge and Expertise on Second Language Vocabulary Acquisition

Some second language researchers have posited that experts in a specific domain have an advantage in understanding second language communications in their area of expertise. Caroline Clapham (1996) made a number of important findings involving the role of topic knowledge in the acquisition of a foreign language. Using reading tests of the International English Language Testing System (IELTS), a test of academic English ability with subtests related to moderately specific fields as biological sciences, she found that students achieved significantly higher scores in their own subject area than on other subtests. However, she found that this effect of topic knowledge grew with increasing expertise. No specific subject area effect was found in undergraduate students, as was found in graduate students. Clapham also found that before adding background knowledge, that 26% of the variance was due to language ability, but that by adding background knowledge, the figure was increased to 38%. Douglas (2000) gathered from this, that highly field-specific texts have a significant background knowledge effect, even among highly proficient test takers, while at the same time calling for more research focused at this area of inquiry. Thus, increased levels of expertise due to topic knowledge appear to promote increased levels of written foreign language comprehension.

Language professionals should therefore keep in mind that the learner's referent world and its first representation, the native language determines to a great extent how quickly and easily a foreign language learner learns a second language. Similarities between languages and world experience help the learner incorporate the new language

into his knowledge base much like a learner does with new information in other domains of knowledge. While the written or spoken form of vocabulary may be the preferred avenue for efficient vocabulary acquisition for new learners and foreign language learners in general, those individuals with a deep vocabulary base in a specific topic area may benefit more from conceptual familiarity.

Individuals learning a language for a specific professional purpose are a special subset of second language learners. It has been said that learning Languages for Specific Purposes (LSP) represent the intersection of language ability and background knowledge (Douglas, 2000). While language ability in general has been highly researched, its relationship to background knowledge and expertise has not. Specific purposes learners generally possess a more specific vocabulary in their domain of interest than general language learners that they may be able to capitalize on in learning a foreign language.

The difficulty presented in LSP classes is specifically that of vocabulary. Specific purpose language vocabulary is generally focused on Greek and Latin-based technical and abstract concepts (Nation, 2001) which require deep conceptual understanding. As the context of a particular word's use becomes more technically specific, the relative number of less frequent content words, which are subtechnical and technical in nature increases (Harmon & Hedrick, 2005), academic vocabulary often being considered a form of subtechnical vocabulary. Indeed, Flood and West (1950) have concluded that approximately 2000 words are needed to "explain everything in science to the lay learner" Because academic words are generally not the focus of secondary school foreign language, they are first encountered in college level foreign language classes. Technical

vocabulary is rarely encountered in university foreign language classrooms (Douglas, 2000).

While technical words are generally of low frequency, they have been found tocarry much of the content in specific domain communications, and are thus vital to communication. Technical words consist of approximately 1,000 entries in dictionaries of specific domains and are rarely encountered in academia (Nation, 2001). Further, Ulijn and Strother (1995) have noted that content words are more critical to the understanding of scientific texts versus general texts, with scientific texts requiring 83% of content words for conceptual analysis but only 38% of function words for syntactic analysis. Whereas these words are relatively common in the topic area, they are not often encountered elsewhere.

Although technical concepts are important to specific purposes learning, technical vocabulary is not the most abundant vocabulary type in technical communications. Vocabulary in academic texts has been divided into basic, sub-technical and technical vocabulary. While the vocabulary required to cover a specific domain is normally thought of as technical, it is generally predominantly semi-technical in nature. Farrell (1990) found that over 44% of electronics text words were semi-technical as compared to 28% technical words. This is likely because less-than-technical words are required to explain technical words or concepts as suggested by Flood and West (1950). Additionally, sub-technical words have been found to be more important in conveying the meaning of the communication than technical words (Marshall & Gilmour, 1991; Nation, 2001), Indeed, learners of language for academic purposes have indicated that the words they do not know are sub-technical in nature (Anderson, 1980). It is therefore

important, in specific professional areas such as that of medical Spanish acquisition, for example, to concentrate on sub-technical vocabulary as much as technical vocabulary.

Fortunately, special purposes learners' need for low frequency words is, in part, mitigated by cognates. The Latin-based words technical words are, in large part, cognates within European languages, possessing striking similarities with the written if not spoken form of English. These words of similar derivation can be easily modified or relabeled in the target language. It has been found that nearly 50% of the English language is derived from Latin-based words (Smith, 1995). The English language, although of Germanic origin, has incorporated many French words of higher register by virtue of the rule of William the Conqueror and his descendents (Mayleth, 1997). Further, English shares many words in scientific and scholarly communications with academics in other European countries using Latin-based languages. In fact, it has been estimated that as many as 72 % of the scientific words in English are derived from Latin (Nation, 2001). Therefore, academia and scientific professionals are more likely to learn Romance (Latin-based) languages quickly than the general populace as so much of the critical vocabulary is similar to English. All foreign language learners may profit from the presence of cognates, but academic and scientific professionals may profit more.

Cognates need not be of similar derivation, they may be borrowed, as in fields that are new or highly innovative, or they may be words derived from older relationships. Hornberger (1989) states that languages sharing many linguistic relationships may be transferred more readily than those with fewer linguistic relationships. Osburne and Mulling (2001) have reported that adult native Spanish speakers make heavy use of cognates in learning English in ESOL classes. Kohnert (2004), in a report on a bilingual

native Spanish-speaking patient with aphasia, reported that naming performance was facilitated in English with pictures of cognates but not with pictures for which no cognate existed. In a study of Persian and French intermediate learners of English, French speakers but not Farsi-speaking University students scored significantly higher on guessing the meaning of English words which possessed French cognate forms (Paribakht & Treville, 2007). Even those languages not considered to be Latin-based possess an advantage for ease of initial acquisition if a substantial portion of their vocabulary comes from Latin-based-words. In a study of Serbian and Chinese-speaking English language learners, the Serbians clearly were able to acquire English more rapidly due to the greater percentage of English vocabulary found in Slavic languages (Basnight-Brown, Chen, Lang, Hua, Shu, Kostic & Feldwen, 2007). Thus, some portion(s) of cognate vocabulary is useful to the foreign language learner.

Specific purposes learners are also unique in their superior understanding of specific concepts and background knowledge in a particular field of endeavor. It has been observed that technical vocabulary only makes sense when other related terms are known (Godman & Payne, 1981). Studies of reading have highlighted the inter-correlation of vocabulary with concept familiarity and background information (Clapham, 1996; DeMarie et al., 2004). Foreign language learners who are familiar with the topic of the text are more likely to understand it with insufficient target language vocabulary (Clapham, 1996). Similarly, vocabulary may be used to substitute for topic familiarity in more proficient foreign language learners. Researchers have employed the close relationship between domain and vocabulary to teach and assess conceptual learning. Graves (1986) advocates the use of semi-technical and technical vocabulary as

a guide to conceptual learning in secondary science instruction. De Marie et al. (2004) used domain-specific vocabulary knowledge to assess content knowledge is selected university majors. Thus, words that are closely associated with a particular domain are likely very important to its understanding. In particular, knowing a technical or semi-technical word means knowing the body of knowledge attached to it, the subject matter domain (Flowerdew, 1992).

A Specific Case of Language for Specific Purposes: Medical Spanish Learning and the Current Study

Medical Spanish affords an opportunity to study facilitated foreign language acquisition, as well as acquisition of Language for Specific Purposes. As technical words in medicine are generally Latin-based, only the supporting subtechnical words should present any phonological difficulty. More importantly, the concepts used in Medical Spanish communications, are assumed to be well understood among medical professionals. Thus, as both are major contributors to vocabulary acquisition, form (phonology/orthography) and meaning (concept/background knowledge) should be easily retrievable, and an investigation of their individual predictive ability of Spanish acquisition should reveal which is more useful in this specific population of learners.

The relationship between native language vocabulary to target language vocabulary acquisition has not been well studied. It is known that first language vocabulary predicts second language vocabulary acquisition, but exactly through what mechanism is not well understood (Kroll et al., 1998). Further, I know of no studies of the effect of topic knowledge and expertise on the vocabulary aspect of foreign language acquisition. Learners of foreign languages for professional purposes possess vocabulary-

related advantages over other learners. First, many students of science already know words similar to target language words in their native language and they may have topic knowledge that will allow them to supply meaning when vocabulary is unknown. Second, as educated people, medical professional are likely to have reasonably good native language vocabulary skills which they can bring to the acquisition of a second language, which previous research has shown to be influential. We do not know to what extent topic knowledge and expertise assists the learner of Language for Specific Purposes relative to his or her general native language vocabulary skills. Moreover, we do not know the extent to which native language vocabulary skills interact with topic knowledge and expertise to facilitate the vocabulary acquisition in Language for Specific Purposes. Therefore, we propose to study a population, health care providers, which can highlight to what extent the above elements are associated with facilitated Medical Spanish acquisition.

CHAPTER 3: STUDY METHODS

Participants

The present study included 44 employees of two public health departments and one university hospital in Georgia. All individuals were native speakers of English between 18 and 64 years of age (90 percent female). Most had some previous Spanish language classroom experience, but not all. Some, but not the majority, had previous experience with Spanish-speaking patients. The majority of the employees were medical professionals:5% physician/nurse practitioners, 27% nurses 21% nutritionists, 5% allied health degree holders, but 42% came from non-degreed clerical and technical positions. Only a slight majority of the study group had previous Spanish instruction; 48% having no formal schooling in Spanish, and 33% with no formal foreign language experience. Participants were recruited on a volunteer basis through public health and hospital system internet announcements. Major incentives for attending the class included enhanced job performance, continuing education credit, and personal enrichment.

Materials and Procedures

Participant testing and instruction occurred in rooms designated by the institutions for instruction. Participants attended at least 8 class sessions out of ten offered over a period of five to six weeks with total instructional time totaling 12 hours maximum. The English vocabulary skill test and experimenter-constructed medical Spanish vocabulary pretest were administered before the first hour of instruction. The experimenter-constructed medical terminology test was administered within the first hour of

instruction. The instructor administered the medical Spanish vocabulary posttest on the final day of instruction. Students had as much time as needed to complete the test, which generally took 20 minutes.

Classes generally began with the presentation of vocabulary by the instructor. Students were given 2 to 3 vocabulary lists of approximately 40 words total which they were asked as a class to pronounce. The instructor subsequently supplied the meaning if no student volunteered it. Next, written exercises consisting of 5-8 English sentences containing those words were translated orally as a class. A grammar sheet covering some aspect of tense was also given to students on five days of the course requiring approximately twenty minutes to complete. Classes emphasized listening and speaking skills, with vocabulary introduction involving the learners writing Spanish equivalents of English words separately or in short phrases.

Assessments. There were three main assessments of interest in the study: (a) the Nelson-Denny Vocabulary Test which served as a measure of English vocabulary skill; (b) the Medical Terminology Test which served as a measure of medical background knowledge, and (c) the Medical Spanish Test, an experimenter-constructed test. There was also a personal background questionnaire, the results of which can be found in Appendix C. The vocabulary assessments were as follows:

(a) Medical Vocabulary Test. Medical Spanish vocabulary can vary depending upon the specificity of the topic and its intended use. The professional status of medical Spanish interlocutors determines to a large extent whether the vocabulary required is highly technical or merely semi-technical. Similarly, as speech tends to be less formal than text, the vocabulary requirements of conversation are less technical than those that

may be read. Salager (1983, 1984) in analyzing a 100,000 word written Medical English corpus, made three divisions in medical English vocabulary; basic English, fundamental medical English, and specialized medical English. Unfortunately, no such corpus exists for oral medical English. Given the greater degree of informality in spoken language and the diminished need for technical (specialized medical) words when patient health provider conversations are the focus, the heaviest vocabulary requirement is for semi-technical (fundamental medical) words. Accordingly, the Medical Spanish Vocabulary test emphasized semi-technical words.

Since medical oral Spanish has not been well researched, we must rely on research on written technical communication, professionals functioning in the health care domain, and general oral Spanish in formulating a Medical Spanish Vocabulary List. Nation (2001) identifies technical vocabulary words as those not normally found in other domains, or found most frequently in a particular domain than elsewhere which are particularly useful for communication in the domain. This, he suggests, should be composed after consulting domain area experts. Thus, first, to create a medical Spanish vocabulary list, I composed a list of 300 words found in four currently used medical Spanish texts, and asked 20 nurses and medical students to rate their importance to communication with patients on a scale of 1 to 5 with 1 being the most important. Next, I selected all words scoring an average of 3 or more for purposes of forming a potential list of test words, yielding approximately 200 words. This list would later be used as a repository from which to select relatively technical and general vocabulary words for the Medical Spanish Test. Second, as Nation (2001) suggests that the 2,000 most frequent words of a language be acquired prior to studying technical vocabulary in a foreign

language, Davies' (2005) general Spanish word frequency book was consulted for the purpose of determining the relative frequency of the words on the potential word list. Words assigned a number greater than 2,000, meaning at least 2000 words are more frequent in general Spanish oral communications, were placed on a semi-technical or technical sub-list. All with a count of under 2000 were placed in a general Spanish sub-list. Finally, the first fifty non-technical words appearing on the sub-list were selected for inclusion on the test, and every other lower frequency word appearing on the list was selected until forty-nine of this group of words had been selected. This distribution of words was selected, as beginning LSP classes initially must teach more general words which occur with more technical words.

Expertise in a foreign language is best demonstrated by the ability to produce communications through expressive vocabulary. Accordingly, the Medical Spanish test employed in the current study (Appendix A) requires the student to produce a Spanish word in response to a prompt by its English equivalent in a supply-response format. The same Spanish vocabulary test was administered pre-instruction and at the end of the course. General Spanish terminology comprised the first half of the test while semi-technical Spanish vocabulary appeared in the last half of the test. Each item required about 15 seconds response time for a total of 25 minutes testing time.

(b) *English Vocabulary Skill Test.* As the learner population ranged from high school graduates to employees with graduate degrees, I chose to administer the Nelson Denny English Vocabulary Test, Form G (Brown, J.I., Fishco, V.V., & Hanna, G., 1993) as my measure of English vocabulary skill. This instrument is designed for secondary students through retirement age, and is in use in diverse scenarios including university

settings to measure native English vocabulary knowledge. The test, it was reasoned, would be difficult enough to provide an acceptable spread of scores, even for college graduates. The skills being measured by the test are recognition of relationships between words and concepts. This instrument is a valid predictor of academic success in this general population (Jackson & Brooks, 1985). Test scale reliability ranges from 0.88 to 0.95 according to the test manual (Brown, Fishco, & Hanna., 1993a). The test includes 80 items of a multiple choice format with five possible responses. It was administered by the investigator at the beginning of the first class session. Subjects were given 25 minutes to complete the test, as directed by the test manual.

(c) Medical Terminology Test. To determine the extent of medical topic knowledge in these public health employees, a medical terminology test was administered prior to instruction in Medical Spanish. The test (Appendix B) consists of fifty items drawn from a Glossary of Technical and Popular Medical Terms in English (University of Ghent, 1995). The first and fifth entry from each of 26 lists were selected, with the omission of first or fifth terms that had greater than one entry, had multiple meanings or which were closely related. English written definitions of one or two words were required for each single English medical term. Students were asked to use the word in a sentence, in cases where the definition was not clear. Correct responses by the students were recorded, and medical background was determined by a continuum of scores from zero to fifty.

(d) *Background Information Sheet.* (See Appendix C.) Learners were asked to indicate the number of years of education and foreign language instruction completed. Years of education ranged between 12 and 20 as all employees must possess a minimum

of the equivalent of a secondary school degree and a few holders of terminal degrees were part of the learner population. Years of foreign language education ranged between 1 and 6 years. This information was only used to describe the learner population.

CHAPTER 4: RESULTS

Each test was graded against a key and the raw score totals on each instrument were calculated. Bivariate scatterplots were examined for outliers. Further, studentized residuals, DfBetas and Cook's D were calculated to identify outliers. Those residuals greater than 3.3 were considered to be outliers. Only one outlier was omitted from the data. Another participant was missing the medical English test and was also dropped from the analysis. Table 1 shows the Pearson correlation matrix for all variables in the study. Table 2 shows the descriptive statistics for the variables in the study. Descriptive statistics of the student scores on the tests reveal the heterogeneity of the study population in all but medical background. No excessive skewedness or kurtosis was found. Reliability of the Spanish posttest as indicated by Cronbach's alpha was found to be .952 for the first, and generally less technical test half and .926 for the second, most technical half. Reliability for the medical terminology test as measured by Cronbach's alpha was found to be .915.

Hypothesis 1

The first hypothesis tested predicts that general English vocabulary skill should significantly influence medical Spanish acquisition. To test this hypothesis, I employed a hierarchical regression analysis in which the Spanish pretest was entered in the first step to control for a priori Spanish knowledge and regressed on Spanish post-test scores. Then, I entered English vocabulary scores on the Nelson-Denny Vocabulary Test in a second step in this analysis.

Table 3 presents unstandardized coefficients, standard errors of the coefficient, and R, ΔR^2, and F statistics for this model. As can be seen, English vocabulary skill accounted for substantial variance in medical Spanish acquisition beyond that accounted for by the pretest, as predicted by this model, t = 2.613, p = .013. The R squared change upon the addition of the English Vocabulary variable was significant before the addition of the variable representing English medical knowledge. However, when English medical knowledge was added to the model, it was a significant additional predictor to the model, t = 2.79, p = .008 and English vocabulary skill was no longer significant, t = 1.395, p =.171. The R squared change affected between addition of English Vocabulary and Medical English was significant. Thus, there is some support for the view that native language vocabulary skill does influence the acquisition of a foreign language vocabulary, but not when other factors are considered.

Hypothesis 2

The effect of medical background knowledge on medical Spanish vocabulary acquisition was also investigated. That is, this hypothesis predicts background content knowledge should facilitate the learning of content vocabulary in a second language. It was predicted that English Medical knowledge would significantly predict Medical Spanish vocabulary acquisition. Those learners employed in a healthcare facility without an extensive background in the allied health disciplines were predicted to score significantly worse on the posttest for Spanish than those who had extensive medical training. The scores on the medical English terminology exam were used to serve as an indication of the medical background of the employees.

Table 4 presents unstandardized coefficients, standard errors of the coefficient, and R, ΔR^2, and F statistics for this model. As can be seen, English medical knowledge accounted for substantial variance in medical Spanish acquisition, beyond that accounted for by the pretest as predicted by this model, t = 3.679, p = .001. While the addition of Medical English to the model produced a highly significant change in R squared, the change affected in R squared was not significant with the subsequent addition of the English Vocabulary variable. Thus, there is substantial support for the view that content knowledge does influence the acquisition of a foreign language vocabulary, even when other factors are considered.

Hypothesis 3

The third hypothesis investigates the nature of the relationship between two predictor variables; medical knowledge and English vocabulary knowledge and medical Spanish acquisition. It was predicted that both English Vocabulary and Medical Terminology would be significant predictors of Medical Spanish vocabulary acquisition when entered into a combined model. Determination of how the two predictor variables influence medical Spanish acquisition, and how they would interact, if at all, was first investigated through multiple regression procedures. Interaction between the two major predictor variable of Spanish acquisition was investigated by introducing interaction as a predictor beyond the main effects of the variables entered individually. Table 5 presents unstandardized coefficients, standard errors of the coefficient, and R, ΔR^2, and F statistics for this model. When Medical English was entered after the Spanish pretest variable into the model, the R squared change was highly significant. The addition of the English Vocabulary variable to the model did not produce a significant change in R squared, nor

did the subsequent addition of the interaction variable to the model. As can be seen, when this interaction term is added, it does not account for additional variance beyond that accounted for by the other variables. Thus, we have little evidence that the interaction between the two variables account for the learning of medical Spanish beyond that accounted for by the contribution of the variables by themselves. In sum, from the analyses above, it seems that there is best support for Hypothesis 2, the view that medical background knowledge is the best predictor of vocabulary learning in the acquisition of medical Spanish.

Table 1 *Descriptive Statistics for the variables used in the analyses.*

						Skewness		Kurtosis	
	N	Min.	Max.	M	SD	Statistic	Std Error.	Statistic	Std. Error
English Vocabulary Raw Score	42	24	80	61.43	13.880	-.976	.365	.519	.717
Medical Spanish Pretest Raw Score	42	0	48	13.50	13.074	1.109	.365	.596	.717
Medical Spanish Posttest Raw Score	42	3	87	35.38	18.342	.898	.365	.722	.717
Medical English Raw Score	42	0	33	13.57	8.893	.308	.365	-.715	.717

Table 2. *Correlations among variables used in the analyses.*

Correlations

		English Vocabulary Raw Score	Medical Spanish Pretest Raw Score	Medical Spanish Posttest Raw Score	Medical English Raw Score
English Vocabulary Raw Score	Pearson Correlation	1.000	.369*	.502**	.449**
	Sig. (2-tailed)		.016	.001	.003
	N	42	42	42	42
Medical Spanish Pretest Raw Score	Pearson Correlation	.369*	1.000	.851**	.174
	Sig. (2-tailed)	.016		.000	.270
	N	42	42.000	42	42
Medical Spanish Posttest Raw Score	Pearson Correlation	.502**	.851**	1.000	.411**
	Sig. (2-tailed)	.001	.000		.007
	N	42	42	42	42
Medical English Raw Score	Pearson Correlation	.449**	.174	.411**	1.000
	Sig. (2-tailed)	.003	.270	.007	
	N	42	42	42	42.00

*.Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

Table 3

Unstandardized Coefficient (B), Standard Error of Coefficient (SE), R, and ΔR^2 for Each Model

Model and Variable	*B*	*SE*	*R*	ΔR^2	*Model F*
Model 1					
Medical Spanish Pretest Raw Score	1.194***	.116	.851	.725	F(1,40) =105.370***
Model 2					
Medical Spanish Pretest Raw Score	1.082***	.117	.875	.041	F(2,39) = 63.777***
English Vocab Raw Score	.288*	.110			
Model 3					
Medical Spanish Pretest Raw Score	1.079***	.108	.898	.040	F(3,38) = 52.517***
English Vocab Raw Score	.156				
English Raw Medical Score	.461**	.165			

Note: * *p< .05* ** *p< .01* ***p< .001*

Table 4

Unstandardized Coefficient (B), Standard Error of Coefficient (SE),R and ΔR^2 for Each Model

Model and Variable	*B*	*SE*	*R*	ΔR^2	*Model F*
Model 1					
Medical Spanish Pretest Raw Score	1.194***	.116	.851	.725	F(1,40) = 105.370***
Model 2					
Medical Spanish Pretest Raw Score	1.128***	.103	.892	.071	F(2,39) = 75.962***
Medical English Raw Score	.558**	.152			
Model 3					
Medical Spanish Pretest Raw Score	1.079***	.108	.898	.010	F(3,38) = 52.517***
Medical English Raw Score	.461 **	.165			
English Vocab Raw Score	.156	.112			

Note: *$p < .05$ **$p < .01$ ***$p < .001$

Table 5

Unstandardized Coefficient (B), Standard Error of Coefficient (SE), R, and ΔR^2 for Each Model

Model and Variable	*B*	*SE*	*R*	ΔR^2	*Model F*
Model 1					
Medical Spanish Pretest Raw Score	1.194***	.116	.851	.725	F(40,1) = 105.370***
Model 2					
Medical Spanish Pretest Raw Score	1.128***	.103	.892	.071	F(39,2) = 75.962***
Medical English Raw Score	.558**	.152			
Model 3					
Medical Spanish Pretest Raw Score	1.079***	.108	.898	.010	F(38,3) = 52.517***
Medical English Raw Score	.461**	.165			
English Vocab Raw Score	.156	.112			
Model 4					
Medical Spanish Pretest Raw Score	1.085***	.108	.901	.006	F(37,4) = 39.811***
Medical English Raw Score	1.141	.659			
English Vocab Raw Score	.269	.154			
Interaction	-.011	.010			

Note: * $p < .05$ ** $p < .01$ *** $p < .001$

CHAPTER 5: DISCUSSION

The purpose of the present study was to examine the influence of two factors believed to influence foreign language acquisition, native language vocabulary base and subject background knowledge. Specifically, the researchers are interested in the influence of native English vocabulary skill and medical background knowledge (measured as knowledge of medical terminology) on Medical Spanish Vocabulary acquisition.

By themselves, both measures, medical knowledge and English vocabulary skill, were significant predictors of Medical Spanish vocabulary acquisition. In this study, we hypothesized that English vocabulary, and to a lesser extent, medical background, represented by medical terminology knowledge, would predict students' ability to acquire Medical Spanish vocabulary. We found, in fact, although both English vocabulary and medical English vocabulary skill do predict Medical Spanish vocabulary acquisition when entered by themselves, that most of the variance in Medical Spanish vocabulary acquisition is explained by the learner's medical vocabulary. The finding that medical vocabulary knowledge explains a substantial portion of Medical Spanish vocabulary acquisition, to our knowledge is a new contribution to linguistic literature. No significant interaction between English vocabulary skill and medical knowledge was found and, when medical background vocabulary was entered, there English vocabulary no longer accounted for any significant proportion of the variance in learning medical Spanish vocabulary.

Language acquisition has been explained through models of short- and long-term memory. Levelt's (1989) highly regarded speech processing model postulates that vocabulary in short-term memory exists as units of meaning (lemmas) and phonological units. Current extensions of this model include that of Coltheart et al.'s (1993) which posits that phonological lexical representations in short term memory are converted to semantic representations in long term memory. Recent native language acquisition models suggest that phonology ceases to become the major avenue for vocabulary acquisition after the establishment of a vocabulary base in long term memory. The probability of semantic representations in long term memory proceeding in the reverse direction to inform phonology in short-term memory has recently been advanced.

Models of short- and long-term memory have been additionally refined to explain the relationship between receptive and productive vocabulary. Receptive vocabulary may be characterized by its feed forward relationship with phonology in short-term memory whereas productive vocabulary has been associated with prior lexical experience or long term semantic stores. Receptive vocabulary, considered more typical of beginning learners, may eventually become productive vocabulary. Productive vocabulary is typically associated with more experienced learners who have a more organized, established vocabulary base. In the case of Medical Spanish Acquisition, productive responses are more reflective of the professional learners' deep vocabulary base.

Models of bilingual memory, similar to those of native language acquisition, also include the delineating factors of meaning (concept) and form. The ability to decode sounds and relate them to concepts has been associated with rapid foreign language

acquisition. The model has recently been refined to apply to early foreign language learners, with more advanced learners relying more heavily on already established native and foreign vocabulary bases. Current models now indicate that words in both languages are located in shared conceptual memory. This model predicts that vocabulary acquisition proceeds more efficiently for concepts already created in the native language as well as in the second language. It is posited that automaticity results from a lowered requirement for working memory by virtue of reliance on the easily retrievable organized conceptual stores of long term memory.

Our study is in agreement with current bilingual memory models. Both aspects of native language vocabulary; background knowledge and form, as indicated by medical English knowledge and general English vocabulary skill, were important in explaining foreign language acquisition. Also in agreement with current models of bilingual memory, our study indicates that those learners with greater background knowledge will find semantic knowledge to be of greater advantage in language acquisition than their general language ability.

The relationship between native language vocabulary and foreign language vocabulary acquisition has been a topic of research interest for decades. The development of bilingual memory models has generated interest in the relative importance of processes in foreign language foreign language acquisition. Most recent studies have favored native language's phonological influence on various aspects of foreign language acquisition. Sparks et al. (1997) noted that specific native language measures as that of decoding ability had not been well studied. They found that native language vocabulary was also a significant predictor of overall foreign language

proficiency (Spanish, French, and German) in high school students after two years of study, although after one year of study, decoding ability was a better predictor. The present study, while agreeing with the importance of native vocabulary in Sparks' second year students, did not investigate the totality of foreign language proficiency, only vocabulary acquisition, and over a much shorter period of time.

A study of non-similar languages presented by Masoura and Gathercole (1999), involving Greek school children learning English, found that phonological memory skills were highly correlated to vocabulary knowledge in both languages. Further, they found that Greek and English vocabulary knowledge shared very close links not accounted for by shared phonological memory. While the value of phonological skill was not the specific focus of the present study, its findings did agree with Masoura and Gathercole that the effect of native language (English) vocabulary on foreign vocabulary acquisition (Spanish) was significant. Moreover, it found that another aspect of vocabulary, topic knowledge, explained additional variance in foreign vocabulary acquisition.

The influence of topic knowledge on foreign language vocabulary acquisition has been studied in multiple contexts. As early as 1937 Chapman and Gilbert noted that English speakers could more easily learn Hindustani nouns if they could define them in English. Similar results were found by Paribakht (2005) in Farsi-speaking college students when students were exposed in text to English equivalents of words known to them in their native language. The present study, while not measuring the acquisition of lexical equivalents, measured topic knowledge through medical terminology knowledge, and did find a highly significant relationship between medical vocabulary knowledge and medically-related foreign language (Spanish) vocabulary acquisition. All of these studies

add credence to the model proposed by Kroll and de Groot (1997) that conceptually similar words sharing the same conceptual store are more easily acquired.

Exceptional circumstances in foreign language learning appear to skew the learner's mode of memory access. The study by Gathercole & Hitch (1997) in which adults with foreign language acquisition difficulties related to phonology, found a tendency to rely on established vocabulary base, circumventing short term memory. The present study does confirm a preference for long term memory in foreign language acquisition, but in learners with no apparent phonological deficit. The motivation for the preference for long memory appears to lie in the unusual advantage presented by the learners' topic knowledge.

Depth of topic knowledge and its relationship to vocabulary acquisition has been investigated in the native language and in foreign language learning. De Marie et al. (2004) found that native language vocabulary (English) recall could be predicted in university undergraduates by importance of vocabulary to major area of study. De Marie et al. noted a threshold for predicting vocabulary acquisition after sufficient coursework had been completed. A similar study by Clapham (1996) found that number of years of university schooling and specificity of vocabulary affected the significance of text comprehension scores. Results of the present study agree with the De Marie et al. and Clapham studies in that very specific topic knowledge is a highly significant predictor of Spanish acquisition, but it did not indicate a threshold at which medical topic knowledge was no longer a significant predictor. It is possible that the high level of specificity of the medical terminology test avoided a ceiling effect in the study population. Additionally,

the present study may have been testing a more difficult, less receptive aspect of vocabulary acquisition.

The two predictors in the present study juxtapose the relative importance of concept familiarity and word form to second language acquisition. Background knowledge becomes significant when in abundance, or, alternatively, when access to form is unavailable. When a link to meaning is essentially unavailable, as when two languages have little in common phonologically, concept familiarity may facilitate foreign language learning. In the present study background knowledge becomes more important *not* because there is no common phonology, but because the apparent immense reservoir of topic familiarity is more profitable.

This study extends the bilingual memory model by its inclusion of more extensively organized concepts in long-term memory. Although most of the healthcare employees were not advanced foreign language learners, they were, on the whole, already acquainted with the concepts that the words represented. In general, foreign language acquisition studies, by virtue of limited availability of subjects, have devoted a disproportionate amount of resources to the study of novice adult learners. While the students may have substantial experience with foreign language learning at the adolescent level, they are not experts in content knowledge. The present study indicates that increased foreign language vocabulary retrieval is in part dependent on the strength of conceptual structures in adults. Thus, prior research, by focusing on language learning in teenagers and young adults without extensive levels of expertise in any subject, has largely missed the key importance of content knowledge in the acquisition of language for specific purposes.

In sum, certain learner population characteristics point to a shift in preference from phonology to topic knowledge. Extent of background knowledge when combined with certain areas of expertise may predispose individuals to rely on concept over symbol/sound representation. Medical vocabulary requirements are likely greater than those of non-technical disciplines. Ulijn and Strother (1995) observed that content words were more important to the comprehension of scientific texts than that of general academic texts. Thus, learners with greater facility in medical terminology than the adult population in general, as those in the present study, may profit more from their understanding of medical concepts over phonology in acquiring Medical Spanish vocabulary.

The apparent advantage of this study group for concept is congruent with current models of working and long term memory. Highly organized concepts in long term memory may free the working memory to attend to and learn new labels in another language. The resulting acceleration of foreign language acquisition is a process not unlike that of expert learning. Researchers have posited that expert content knowledge is characterized by an organization that promotes deep understanding and is thus more easily retrievable (Bransford, Brown, & Cocking, 2003). As Schneider and Shiffrin (1985) observed, as novices must expend greater attentional effort on remembering versus learning, they are substantially handicapped when both concept and foreign language label must be learned simultaneously. Therefore, the savings in attentional effort when the concept is well understood may be conserved for additional foreign language learning.

Implications for Pedagogy

Our findings may be of interest to various levels of foreign language educators and to training professionals. A curricular shift toward content-centered vocabulary may be warranted for adult early foreign language classes. Instructors of Languages for Special Purposes (LSP) courses and ESL (English as a Second Language) programs may find that less emphasis on general vocabulary and more on vocabulary needed in key communication scenarios encountered by the students can facilitate more rapid acquisition of core vocabulary and subsequent fluency. Businesses contemplating training employees who will communicate with foreign language speakers may wish to include professional terminology knowledge as a key criterion for selection of personnel.

Limitations

The present study evaluated a population of foreign language learners that has not been well studied. Although the novelty of this group of learners extends knowledge of adult language acquisition, it was difficult to study in depth. The healthcare employees included in the study were not always able to attend class. Sample size, although acceptable, might have increased reliability. It should also be noted that three separate groups of healthcare employees were involved in this study. Two public health departments, representing almost two thirds of the subjects and employees of a large private university hospital were represented. The fact that the study included both hospital employees and public health employees would tend to broaden its applicability to healthcare employees. While medical terminology tests for English speakers could not be found, there was a strong correlation between the Medical Spanish posttest scores and the medical terminology test, indicating that, to a great extent, that the medical

terminology test was a valid indicator of medical vocabulary knowledge. Further, the reliability of the English medical terminology test showed excellent reliability.

Differences in the format of the three tests may have impacted the study results. While the Spanish and Medical tests were both of short answer format, the English vocabulary test was multiple choice. The form of the response, to a certain extent, implies the nature of the knowledge being assessed. The Spanish and medical tests measured productive knowledge. The Nelson Denny Vocabulary test could be considered less a measure of productive knowledge. Therefore, correlations observed between the variables may have been affected by the format of the English vocabulary test.

Another issue that needs to be dealt with is that the pre- and post-test used was a paper-pencil test and not the potentially more valid situation of using oral vocabulary to communicate with others. For example, a test evaluating the use of vocabulary in a medical setting would possibly be a more valid indicator of vocabulary learning than the test used here. Therefore, it is possible that vocabulary deployed in a more realistic medical setting situation might be shown to be more differentially affected by general vocabulary skill than was displayed in the current study.

Directions for Future Research

The present study extends the model of bilingual memory to a heretofore understudied population, that of healthcare workers. As an unanticipated predictor of foreign language acquisition was found in this group of adults, future research should be directed toward populations outside of the university community to more closely ascertain how various pockets of expertise can be exploited to facilitate the acquisition of

new second language vocabulary during the working years. Second, the current study had a relatively short duration between the acquisition of the vocabulary through coursework and testing. Future studies could examine the influence of topic knowledge versus general first language vocabulary skill over a long period of time. It may be that, at longer periods of time, general vocabulary skills come into play. Further, investigations employing short answer instruments for all predictor and dependent variables are needed to better determine if type of test instrument affects prediction of foreign language vocabulary acquisition.

In sum, we find that foreign language vocabulary acquisition is not a monolithic process; it is driven by the information that precedes it, be it form or substance. Accordingly, all language learners are not alike; they chose the path that is to their best advantage. Foreign language learning is the product of memory systems that preferentially select new information most compatible with that already stored.

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APPENDIX A

SPANISH TEST

Please supply a one or two word Spanish translation.

1. hour _____
2. son _____
3. head _____
4 . heart _____
5. hand _____
6. foot _____
7. eye _____
8. mouth _____
9. little(amount) _____
10. small _____
11. large _____
12. pain _____
13. day _____
14. (the) last _____
15. (the) next _____
16. good _____
17. bad _____
18. since _____
19. until _____
20. after _____
21. before _____
22. low _____
23. more _____
24. up/above _____

25. high _____
26. water _____
27. to break _____
28. to go up _____
29. to remove _____
30. to exit _____
31. to help _____
32. to live _____
33. to die _____
34. to know _____
35. to change _____
36. to feel _____
37. to open _____
38. to close _____
39. to have _____
40. to come _____
41. to sleep _____
42. to understand _____
43. to be able to (can) _____
44. to need _____
45. to take _____
46. to put _____
47. to run _____
48. to eat _____
49. to take out _____
50. to look at _____
51. nurse _____
52. wound/injury _____

53. pregnancy _____
54. stitches _____
55. liver _____
56. kidney _____
57. throat _____
58. lungs _____
59. allergy _____
60. rash _____
61. height _____
62. birthing _____
63. a drop _____
64. fever _____
65. a cold _____
66. flu _____
67. mumps _____
68. cough _____
69. pill _____
70. electrolyte fluids _____
71. treatment _____
72. vaccination _____
73. discharge(of fluid) _____
74. prescription _____
75. chills _____
76. gush/stream (of fluid) _____
77. navel _____
78. stroke _____
79. tremor _____
80. street drugs _____

81. pimple _____
82. fainting _____
83. dizziness _____
84. gallbladder _____
85. urinary bladder _____
86. tingling _____
87. numbness _____
88. IUD _____
89. To stick/sting/puncture _____
90. To breastfeed _____
91. To choke _____
92. To rape _____
93. To urinate _____
94. To suck _____
95. To exhale _____
96. To inhale _____
97. To swallow _____
98. To burp _____
99. To turn (over) _____

APPENDIX B

MEDICAL TERMINOLOGY

Please supply a **brief definition** and **a sentence** for each of the following terms.

EXAMPLE: **virus** Defin: a non-living microbe **Sentence:** The virus caused his cold.

1. **epithelioma** _____ **Sentence**_____
2. **rhinorrhoea** _____ _____
3. **bacillus** _____ _____
4. **perianal** _____ _____
5. **cachexia** _____ _____
6. **calciuria** _____ _____
7. **curettage** _____ _____
8. **haemerolopia** _____ _____
9. **tympanemium** _____ _____
10. **maxillary** _____ _____
11. **faecal** _____ _____
12. **galactorrhea** _____ _____
13. **ganglion** _____ _____
14. **haematemesis** _____ _____
15. **piloerection** _____ _____
16. **iatrogenic** _____ _____
17. **idiopathic** _____ _____
18. **icterus** _____ _____
19. **articular** _____ _____
20. **stasis** _____ _____
21. **keratolyte** _____ _____
22. **labile** _____ _____
23. **anosmia** _____ _____
24. **maceration** _____ _____

25. **impregnation** _____ _____
26. **vagal** _____ _____
27. **nasolaryngeal** _____ _____
28. **obstipation** _____ _____
29. **occlusion** _____ _____
30. **arthralgia** _____ _____
31. **glossodynia** _____ _____
32. **QRS complex** _____ _____
33. **Quaternary** _____ _____
34. **Tachycardia** _____ _____
35. **Radiological** _____ _____
36. **Sigmoid** _____ _____
37. **Salpingitis** _____ _____
38. **Tardive** _____ _____
39. **Laceration** _____ _____
40. **Ulcerogenic** _____ _____
41. **Autonomic** _____ _____
42. **Nadir** _____ _____
43. **Fluor albus** _____ _____
44. **Ambulant** _____ _____
45. **Cloaca** _____ _____
46. **Xanthoma** _____ _____
47. **Xerophthalmia** _____ _____
48. **Entercolitis** _____ _____
49. **Catheter** _____ _____
50. **Auricular** _____ _____

APPENDIX C

QUESTIONNAIRE

Please indicate your **number of years of formal education** (not kindergarten) including all university studies through graduate and professional schooling. _____

Please indicate your **number of years** of formal foreign language training (not including sign language) _____

Please **circle** your personal evaluation of your **proficiency** in a foreign language.

Language Name: _____

Proficiency:

1. I know no foreign language at all.
2. I can say some individual words a few common phrases.
3. I can communicate a few needs with very short phrases that I have learned. Native speakers have great difficulty understanding me.
4. I can combine a few words to make original phrases about common topics. Native speakers sometimes have a hard time understanding me.
5. I can ask and answer simple questions and can generally be understood by sympathetic native speakers, although I make many errors.
6. I can handle uncomplicated tasks and can discuss personal history and leisure activities. There may be long pauses with many errors, but can be understood by sympathetic speakers.
7. I can handle most uncomplicated communicative tasks and social situations. I can begin and end conversations on a range of topics with obvious errors. I still have limited vocabulary and sometimes need to repeat myself. Native speakers can generally understand me.
8. I can function adequately in the language at work. I am able to produce a conversation of a paragraph's length that is understandable to native speakers.

SURVEY OF RESULTS

	Education Yrs.	Span Yrs.	FL Years	Percvd Profcy
N	42	42	42	42
Mean	15.631	1.417	2.155	2.548
St. Deviation	2.381	1.808	2.126	1.626
Range	8.00	7.00	7.00	6.00