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The effect of the presence or absence of dictionary access on incidental vocabulary learning for college intermediate Spanish learners reading Spanish texts.

Knight, Susan Marie, Ph.D.

The Ohio State University, 1992

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THE EFFECT OF THE PRESENCE OR ABSENCE OF DICTIONARY ACCESS ON INCIDENTAL VOCABULARY LEARNING FOR COLLEGE INTERMEDIATE SPANISH LEARNERS READING SPANISH TEXTS

DISSERTATION

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

By
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*****
The Ohio State University

1992

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Gilbert A. Jarvis, Adviser
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1992
To Gary,
who has always encouraged and supported me
in the achievement of my dreams
ACKNOWLEDGMENTS

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CHAPTER I
THE PROBLEM

Introduction
Most students studying a foreign language (FL) state that learning vocabulary is their primary concern (Crow, 1986; Nunan, 1988; Yorio, 1971). This concern is also reflected at the teaching end of the learning-teaching spectrum. Candlin (1988) points out that in beginning courses "the study of vocabulary is at the heart of language teaching in terms of organization of syllabuses, the evaluation of learner performance, and the provision of learning resources (p. viii)."

The importance of lexical acquisition is especially evident in the reading process. Indeed, vocabulary knowledge seems to be the most clearly identifiable subcomponent of the ability to read, according to Chall (1987) and Nation and Coady (1988). Studies in first language (L1) (Anderson & Freebody, 1981; Davis, 1944, 1968, 1972; Harrison, 1980; Spearitt, 1972) and in second language (L2) (Barnett, 1986; Henning, 1975; Koda, 1989, 1990; Pike, 1979) attest to its importance.
The sizable correlation between vocabulary knowledge and reading comprehension has led many to hypothesize that a large amount of vocabulary is learned through reading (Jenkins & Dixon, 1983; Jenkins, Stein, & Wysocki, 1984; Nagy & Anderson, 1984; Nagy, Herman, & Anderson, 1985). Research of this long-standing hypothesis, however, has just begun.

**Historical Perspective**

The notion that vocabulary can be learned through reading is not a new one. Boettcher (1980) quotes sources as far back as St. Augustine in support of this view. It was not until the last few decades, however, that the use of contextual cues for obtaining meaning was encouraged for L2 learners. Twaddell (1973) was among the first to urge FL students at the intermediate level to guess at words in written context, stating that it was impossible to teach learners all of the words they need to know, or to expect them to look up the majority of these words in dictionaries.

In 1978, Judd published an article asserting that vocabulary be given the status of a skill in its own right, that it should neither be subservient to syntax nor viewed as an appendage to reading and listening comprehension. He stressed presenting vocabulary in natural linguistic contexts so that the learner could come to know a word’s polysemic and registerial characteristics. Vocabulary acquisition through reading gradually
came to be seen as a dynamic process—a process that begins with unclear references, partial conceptual notions for words, and instability of meaning (Lord, 1974).

Recent Studies Testing the Hypothesis

In the last decade, L1 researchers have begun to investigate the assumption that many new words are learned through reading. As Nagy and Anderson (1984) state, "even the most ruthlessly systematic direct vocabulary instruction could neither account for a significant proportion of all the words children actually learn nor cover more than a modest proportion of the words they will encounter in school reading materials" (p. 304).

In addition to this default explanation, others who hypothesize that words are learned while reading do so based on studies showing that students derive meaning from context—the first step in learning (Ames, 1966; Carnine, Kameenui, & Coyle, 1984; Liu & Nation, 1985; Quealy, 1969; Rankin & Overholser, 1969; Sternberg & Powell, 1983). Yet, results of studies in which subjects guess word meanings with the text in hand do not necessarily indicate how likely those subjects are to remember the derived meaning.

To date, only four major studies, all in L1, have dealt with incidental learning of real words while reading (Jenkins, Stein, & Wysocki, 1984; Konopak et al., 1987; Nagy, Anderson, & Herman,
Although results differ, general findings show small but significant gains in word knowledge. These results, however, have been questioned by other researchers whose studies show that students are often unable to gather word meaning from context (Kelly, 1990; Schatz & Baldwin, 1986; Williamson, 1989).

Thus, although vocabulary learning is now a growing area of research, understanding of the acquisition process during reading and the contextual conditions that favor the process is still limited in L1 and even more so in L2 (Channell, 1988). Further investigation of the incidental learning-reading relationship is needed.

**Statement of the Problem**

The primary question of this study is: Do college FL learners acquire a significant amount of vocabulary while reading authentic texts? Two separate issues need to be examined in answering this question, both of which give further direction to the present study. First, even though L1 has provided the theoretical and empirical foundation for much of L2 vocabulary research, can the cited L1 results on incidental learning automatically be applied to the L2 situation? Are the learners and the situations the same? Second, if L1 studies are used as a starting point for L2 investigation, what are the problems in
those studies and how can they be addressed to make results more generalizable?

**Differences in L1 and L2 learners**

Although various parallels have been drawn between L1 and L2 vocabulary learning, the question of whether similar results would be found in the college age FL students had not been investigated. The L1 results cannot be extended to the L2 learning situation because the learners differ in several significant ways—ways that might alter learning results.

First, FL college students are in a different psychological position than the elementary school subjects in the L1 studies. Not only have they already mastered one language and established conceptual representations for many words, but they are also cognitively more mature and generally learn more quickly (Ausubel, Novak, & Hanesian, 1978). While much of L1 reading after the third grade involves concept learning, the word factor that Nagy et al. (1987) found to be most significant in learning from context, L2 reading involves a process called "concept re-formation" (Jarvis, 1991). Although beginning L2 students who are exposed to only one meaning in a single context usually attach a new foreign label to their L1 concept, "with each succeeding encounter with the new word...the learner gradually infers the criterial attributes of the new target language word and thereby
gradually distinguishes it from the native language word that had been the point of departure" (p. 35).

A second difference is that most FL readers do not have the advantage of an established listening vocabulary to aid them as they begin the reading task (Hague, 1987). The L1 elementary readers, on the other hand, have large listening and speaking vocabularies—much larger than their reading and writing vocabularies (Deighton, 1959).

A third difference lies in the fact that L1 and L2 students often employ different strategies when they encounter unknown words. Although the L1 and L2 readers may guess at the meanings of unknown words encountered in written context, the L2 student is much more likely than the L1 student to consult a dictionary (Bensoussan, Sim, & Weiss, 1984). Indeed, studies show that L2 students, unlike L1 students, perceive dictionary usage to be more effective in developing vocabulary than extensive reading (White, Vierma, Kang, Krashen, & Tritica, 1987). The basic question of whether or not contextual guessing is more conducive to word learning than dictionary use, however, is still unanswered (Carter & McCarthy, 1988).

Most research involving dictionary learning has focused on instructional techniques rather than on natural usage. The studies that have offered students dictionary access have not
calculated whether or not students actually used the dictionary. This study, however, measures non-instructed learning based on actual dictionary usage.

Factors causing variation in the L1 studies

Several factors in the L1 studies make it difficult to generalize the results. Analysis of these variables gives further direction to this L2 study; namely, differences in individuals, differences in texts, and differences in measurement.

Individual differences. First, in the guessing-from-context studies, the highest percentages of correct guesses came from studies with older, more educated subjects (e.g., Ames, 1966; Liu & Nation, 1985). These results are probably inflated, however, because research has shown that subjects who differ in ability level do not construct meaning from context in the same way or to the same degree (Adams & Huggins, 1985; Bensoussan & Laufer, 1984; Haynes, 1984; Van Daalen-Kapteijns & Elshout-Mohr, 1981). The present study investigates learning from context by dividing college intermediate Spanish learners into two levels, low- and high-verbal ability, in order to analyze more specifically which factors contribute to incidental learning.

Text differences. A second reason why the L1 results are often difficult to generalize is because the words targeted as well as the contextual cues were often not what a reader normally
encounters in a natural text. For example, Gipe (1979) and Jenkins, Stein, and Wysocki (1984) used specially constructed paragraphs in which the contexts were overly supportive (i.e., written definitions were provided). The opposite situation, virtually no contextual support, is seen in other studies (e.g., Schatz & Baldwin, 1986). Another artificial condition is the use of nonsense words for target words (e.g., Ames, 1966; McKeown, 1986; Saragi et al., 1978), a condition that eliminates any type of cue within the word itself.

In order to study more realistically the actual task of an intermediate-level reader, the present research uses authentic articles from Spanish newspapers and magazines instead of isolated sentences or paragraphs. The use of longer articles permits inferencing at the situational and discourse levels as well as at the sentence level (Drum & Konopak, 1987). In addition, only naturally occurring difficult words are targeted for recall to allow for inferencing based on morphological cues.

Measurement differences. A third problem, seen in both the meaning derivation and learning studies, is the method of measurement. Different techniques of assessing word knowledge have led to different estimates of word knowledge (e.g., Jenkins et al., 1984; Nagy et al., 1985). In this study, tests are constructed to detect learning at two receptive levels. Testing
at the receptive, or recognition-only, level is important because a single encounter with a word in context is likely to provide only a small gain in knowledge (Deighton, 1959; Stahl, 1983).

Timing of measurement has also led to different results. The Nagy et al. 1985 study, for example, tested vocabulary 15 minutes after the reading and showed a greater amount of learning than the 1987 study, which tested vocabulary six days later. Retention needs to be examined by using both immediate and delayed tests.

To summarize the problem, it is not known if L2 learners acquire a significant amount of vocabulary while reading. In addition, it is not known which of the different ways of discovering word meaning (i.e., guessing from context or using the dictionary) is most effective; nor is it known if the verbal ability level of the student makes a significant difference in terms of number of words learned or in terms of the manner in which they are learned. Empirical evidence is needed in L2 that can either substantiate or negate the present hypotheses.
Significance of the Problem

Finding answers to the above questions has both theoretical and pedagogical significance.

Theoretical Significance

Candlin (1988) states that the study of vocabulary offers insights into the process of second language acquisition (SLA), that it helps in understanding how learners come to master and exploit relationships and structure, in lexis no less than in syntax. Among the various theories of SLA are those suggesting that language learning is primarily incidental and not intentional in nature; that comprehensible input, be it oral or written, is the crucial factor for learning. More research, however, is needed if these claims are to be moved from their conjecture status.

This study also provides data to help answer additional theoretical questions, such as: what is the relationship between intentional and incidental learning? Is it possible to learn new vocabulary from context yet not understand the gist of the text? Is it possible to have a high degree of text understanding yet learn no new words? According to Bernhardt's Constructivist Model (1986), word recognition is only one of the six interactive factors involved in L2 reading comprehension, the others being: syntactic feature recognition, metacognition, intratextual
perceptions, phonemic/graphemic features, and prior knowledge. It is still unknown, however, the exact role that word recognition plays in reading comprehension. An examination of vocabulary learning through reading may provide more information on this topic.

Pedagogical Significance

Vocabulary acquisition for the university student beginning a foreign language is relatively easy compared to the task faced by the intermediate student. During the first two years, entire chapters of texts are often centered around specific, new vocabulary, which most instructors teach to some degree. After two years of instruction and graded texts, however, the student is suddenly expected to learn words through context while reading authentic materials (Crow, 1986; Hague, 1987; Schulz, 1981).

Schulz (1981) makes an analogy to infant nutrition, "We do not just expect to wean the students from the bottle to the cup; we hand them knife, fork, and the uncooked ingredients for a gourmet meal and expect them to enjoy a Lucullan repast" (p. 43). The pedagogic question, of course, is: Does the intermediate student indeed learn a significant amount of new vocabulary through reading? Is instruction, perhaps, still necessary? Empirical evidence is needed to make these judgments (Marzano & Marzano, 1988).
Another widespread instructional practice is to advise students to guess the meaning of unknown words by using the written context and to refrain from using the dictionary (Haynes, 1983; Summers, 1988). According to Carter and McCarthy (1988), however, proof is needed that "the information learners obtain from meeting words in a variety of contexts is more beneficial, either in terms of knowledge of forms or meanings of lexical items, than either translation or simply looking up the word in a dictionary" (p. 15).

A third pedagogic concern involves how to help students of different verbal-ability levels. Should certain students be encouraged to guess word meanings? Does dictionary use and the potential disruption of short-term memory that may result affect comprehension for certain students? This study provides information to help answer these questions.

In summary, the rationale for conducting this study was twofold:

1. To provide additional insight into how students acquire vocabulary.
2. To provide an empirical foundation for pedagogical practices currently being used.
Purpose of the Study

The purpose of the study was to investigate incidental learning of vocabulary while students focus on reading for meaning. College intermediate Spanish learners at two different verbal ability levels were randomly placed into two different reading conditions: dictionary access or no dictionary access. Each condition was exposed to four texts; however, subjects within a condition read only two of the four texts. Each set of two articles (text-set) contained 24 targeted, unknown words. The incidental learning of these words was assessed in two different ways in order to account for even a small increase in word meaning knowledge. In addition, intentional learning, comprehension of the passages, was also tested.

The research questions were:

1. Is there a significant difference between the exposure and the no-exposure condition as measured by vocabulary scores?

2. Is there a significant difference for low- and high-verbal ability students on vocabulary learning measures?

3. Is there a significant difference between the dictionary access and the no-dictionary access conditions on the vocabulary learning measures?
4. Is there a significant interaction between ability levels and dictionary/no-dictionary access on vocabulary learning measures?

5. Is there a significant difference between immediate and delayed testing on the vocabulary learning measures?

6. Is there a significant difference between the dictionary access/no-dictionary access conditions on the reading comprehension scores?

7. Is there significant interaction between ability level and dictionary access/no access on reading comprehension scores?

8. Is there a correlation between comprehension of text (intentional learning) as measured by scores on recall protocols and vocabulary learning (incidental learning) as measured by vocabulary scores?

9. Are there differences in the correlations between incidental learning and intentional learning for students of different ability levels?
Definition of Terms

**Incidental learning:** Learning that is not intentional in nature, that is derived as a result of being given another task (i.e., the amount of vocabulary learned through reading when the stated task is text comprehension).

**Intentional learning:** Learning that results from specifically attending to a task (i.e., scores on the recall protocol when the stated task is text comprehension).

**Texts:** Four expository articles selected from Spanish newspapers or magazines and used as reading selections in the present study. Each was approximately 220 words in length.

**Exposure condition:** One of the treatment variables in which a subject was exposed to 24 unknown target words while reading a text and later tested on those words.

**No-exposure condition:** A treatment variable in which a subject was tested on 24 words that have not been previously encountered in reading.

**Dictionary access:** One of the reading conditions in which students were be able to access the English meaning of a Spanish word on the computer by typing the base form of the word on the screen.

**Unfamiliar words:** 48 words selected from the four texts that were judged as unfamiliar by all three of the following standards: (a)
words not included in the dictionaries of the Spanish 201 and 202 texts used by the subjects in the study, (b) words judged unfamiliar by the Spanish 202 instructors, and (c) words checked as unknown by individual subjects on the Checklist Vocabulary Test.

**Checklist Vocabulary Test:** A pretest based on Anderson and Freebody's (1983) Yes/No Vocabulary Test to test for prior knowledge of the selected unfamiliar words.

**Verbal ability:** High- or low-verbal ability as determined by subjects' ACT verbal scores.

**Learning from context:** A gain in semantic knowledge of a word after reading it in context as measured by results on the Select-Definition Test and the Supply-Definition Test.

**Select-Definition Test:** A multiple-choice test designed to measure the ability to recognize the correct English translation of a given Spanish unknown word.

**Supply-Definition Test:** A fill-in test designed to measure the ability to supply correctly an English equivalent, definition, or explanation when presented with a Spanish word.

**Immediate testing:** Administration of the Select-Definition and the Supply-Definition Tests immediately following the reading and recall of the
Delayed testing: Administration of the Select-Definition and the Supply-Definition Tests two weeks after the reading and recall of the passages.

Recall protocol: A post-reading task to measure reading comprehension. Students wrote in English everything they could remember about each article read. The protocol was scored according to Johnson's propositional analysis system (1970).

Theoretical Considerations

Incidental Learning

SLA literature indicates that two different processes are involved in gaining knowledge about L2: (a) incidental learning--development by exposure to a language without conscious learning or without overt explanation through direct teaching, and (b) intentional learning--development through focused attention on the item to be learned or through overt teacher explanation to which the learner applies various intentional strategies. Some theorists believe that acquisition occurs simply by being exposed to comprehensible input in the FL, by focusing on meaning rather than form (e.g., Gee, 1988; Hafiz & Tudor, 1989; Krashen, 1985, 1989). Others believe that although comprehensible input is important, acquisition does not occur without interaction (e.g.,
Studies that have focused on incidental learning of vocabulary words in L1 show that recall is increased when words are encountered in the context of semantically demanding tasks, such as reading, testing for ambiguity, or testing for fit in a sentence frame (Craik & Tulving, 1975; Schallert, 1976). In the cited studies, recall of both words and text was enhanced by "deep processing"—a series of stages in which "depth" refers to the degree of semantic or cognitive analysis performed on a word by the learner, and thus, to the degree that the lexical item will be retained (Williamson, 1989).

Other studies of short-term memory (Anderson & Reder, 1979; Johnson-Laird, Gibbs, & de Mowbray, 1978) concur by showing that meaningful tasks—those requiring a subject to engage in deeper processing or to make more elaborate connections between new and known information—lead to better retention. Similarly, Perrig and Kintsch (1985) found that readers cannot make conscious inferences about a text or about vocabulary unless a situational model has been constructed first in the brain. Theoretically, the more deeply the text is processed, the more elaborate the situational or mental model becomes and, as a result, the more likely that new vocabulary will be understood and retained (White,
Theories of Learning from Context

How do readers learn unknown words from context? What are the contextual factors that influence learning a word, guessing its meaning, or even selecting its most appropriate dictionary definition? Several theories attempt to answer these questions, among them Drum and Konopak (1987), Nagy et al. (1987), and Sternberg and Powell (1983).

Nagy et al. (1987) state that the amount of vocabulary a child actually gains from written context depends on three factors: the volume of the child's exposure to written language, the quality of the text, and the child's ability to infer and remember the meaning of new words encountered during reading. Other theories are in general agreement and separate variables into two general groupings--reader and text.

Reader variables. Sternberg (1987) calls the reader-based factors knowledge-acquisition processes. These processes include: (a) selective encoding--separating relevant from irrelevant information for the purposes of formulating a definition, (b) selective combination--combining relevant cues into a workable definition, and (c) selective comparison--relating new information about a word to old information already stored in memory.
Text variables. Text properties include both individual word properties and context properties. Nagy et al. (1987) cite three variables that help determine whether an individual word will be learned incidentally from context.

1. Word difficulty. How difficult a word is to learn depends on the state of the learner's knowledge. For example, learning a synonym for a known concept is much easier than learning a word for an unknown concept (Graves, 1984; Jenkins & Dixon, 1983; Nagy et al., 1987).

2. Part of speech. Some evidence has been found that nouns are learned in greater numbers than verbs at the early stages of language acquisition (Gentner, 1982).

3. Morphological transparency. Evidence exists that at least some children make use of morphological relationships when learning new words (Freyd & Baron, 1982).

In addition to word properties, there are also contextual properties. Perhaps the most detailed analysis of contextual factors is found in Sternberg and Powell's (1983) Theory of Learning from Context. It distinguishes between those aspects of vocabulary acquisition that lie strictly outside of the individual learner (i.e., Contextual Cues present in the verbal context itself) and those aspects of vocabulary acquisition that lie at least partially within the individual learner (i.e., Mediating
Variables that affect the perceived usefulness of the contextual cues.

Contextual Cues. Sternberg and Powell propose eight classes of contextual cues, cues that can facilitate or impede deciphering the meaning of an unknown word. Jenkins and Dixon (1983) illustrate several of these cues in the following paragraph with the unknown word "trok."

Ann wiped the morning sleep from her eyes, leaned against the sink and lifted her trok from its holder. She squeezed some paste onto its bristles and wet it, but just as she put the trok in her mouth, the phone rang (p. 249).

The contextual cues included here are: (a) temporal (morning), (b) spatial (near sink), (c) stative descriptive (bristles), (d) functional descriptive (pasted, wetted, and placed in a mouth). Other cues delineated by the theory are: (e) value (worthy or desirability of X), (f) causal/enablement (what brings X about), (g) class membership, and (h) equivalence (synonyms, definitions, or antonyms).

Only certain types of these cues are presented in context, and even when a given cue is present, the theory proposes that the usefulness will be mediated by other variables.
Mediating Variables. The seven mediating variables listed by Sternberg and Powell are:

1. Number of occurrences of the unknown word: multiple occurrences increase the number of available cues and can increase the usefulness of cues if the reader integrates this information.

2. Variability of contexts in which multiple occurrences of the unknown word appears: variable contexts increase the likelihood that a wider range of types of cues will be supplied and thus aid the reader.

3. Density of unknown words: in passages containing a relatively high number of unfamiliar words, context provides less information about the meaning of any single word.

4. Importance of the unknown word to understanding the context in which it is embedded (both at the sentence level and at the overall passage level): words perceived as unimportant are often skipped over by readers.

5. Helpfulness of the surrounding context in understanding the meaning of the unknown word and its proximity.

6. Concreteness of the unknown word: in general, concrete referents are easier to comprehend than those with abstract referents.
7 Usefulness of prior knowledge in cue utilization: usefulness will depend in large part on a given individual's ability to retrieve information, to recognize its relevance, and then to apply it appropriately (Sternberg, 1987, pp. 92-94; Sternberg & Powell, 1983, p. 883). It also includes limitations of the individual's working memory (Daneman & Green, 1986; Harrington & Sawyer, 1992).

The importance of these contextual and mediating variables in determining meaning has been verified by numerous studies (e.g., Beck, McKeown, & McCaslin, 1983; Carnine, Kameenui, & Coyle, 1984; Drum, 1983; Jenkins et al., 1984; Nagy et al., 1987; and Sternberg & Powell, 1983).

Assumptions

The following assumptions were made in order to conduct this study:

1 Subjects would cooperate and would answer test questions in a manner that best reflected what they had learned from the texts.

2 Subjects would be able to follow the ideas in the texts and would have sufficient command of FL vocabulary, grammar, and reading skills to achieve basic comprehension.
3 The select-definition and supply-definition tests would serve as a means of triangulation to measure even small levels of receptive learning.

4 The recall protocols would adequately measure reading comprehension.

5 Subjects' ACT verbal scores would provide an adequate basis for classifying subjects according to high- and low-verbal ability.

6 Comprehension from reading an article on the computer screen would be equivalent to comprehension from reading the article in a magazine or newspaper.

7 Subjects would be sufficiently familiar with the computer to accomplish the required tasks.

Limitations

1 The 48 target words used to measure learning were selected because they were unknown to the subjects. Results may vary, however, by selecting different unknown words in different contexts.

2 This study serves only as preliminary information in evaluating incidental learning. No definite conclusions are possible from one study using only 48 targeted words.
Although four different texts were used to control for text type, replication of this study using other texts is advisable.
CHAPTER II
REVIEW OF THE LITERATURE

Overview

The present study sought to determine if students learn vocabulary while reading authentic texts, and if so, how. The research questions put forth are rooted in L1 and L2 vocabulary investigations, and particularly in studies of contextual guessing, contextual learning, and dictionary use. As Pressley, Levin, and McDaniel (1987) point out, however, it is critical to distinguish between studies focusing on inferring or guessing word meaning from contextual cues and those focusing on remembering word meaning. Although deriving meaning from context is a prerequisite for learning from context, learning is not an automatic outcome.

The review of literature, therefore, includes both L1 and L2 studies and is divided into three major areas: (a) derivation of meaning from context, (b) dictionary usage to determine word meaning, and (c) incidental vocabulary learning while reading. The final part of this review focuses on the instruments used in the present study—examining them in light of previous studies.
In addition, a brief review of the research investigating reading via the computer is also included.

**Derivation of Meaning From Context and Related Factors**

The two major strategies available to the reader who encounters an unfamiliar word while reading are to guess the meaning based on contextual cues and/or use a dictionary (Carnine, Kameenui, and Coyle, 1984). In recent years, many researchers, teachers, and textbook authors have encouraged students to guess the meanings of unknown words, to use inference as the strategy of first choice (Clarke & Silberstein, 1977; Hosenfeld, Arnold, Kirchofer, Laciura, & Wilson, 1981; Nation, 1987, 1990; Twaddell, 1973). This advice, however, appears to be based more on conjecture than on empirical findings. It is still unknown whether guessing meaning is more beneficial to word learning or to reading comprehension than utilizing a dictionary (Carter & McCarthy, 1988).

Studies that have investigated the ability of subjects to derive meaning from context can be divided into three areas: (a) types of clues available in context, (b) learner success or failure in using available clues, and (c) the effect of training on using clues. The second category is the most relevant to this study, although the interpretation of the results of these studies
often involves factors relating to the first category. (See Theoretical Considerations.)

How likely is it that a reader will guess word meaning from context? The highest estimates come from two studies. Liu and Nation (1985) found that advanced L2 learners could guess between 85% and 100% of the unknown, low-frequency words occurring in a text. Ames (1966) also found a high rate of success for L1 students when he replaced every 50th word in text with a nonsense word. His subjects, 12 doctoral level students, successfully guessed 60% of the unknown words.

In both of these investigations, however, the subjects were highly educated adults, making generalization to other groups difficult. Studies that have specifically separated subjects according to age or ability levels indicate that older subjects as well as subjects with higher verbal ability are better able to guess meaning from context. In addition, these subjects often derive meaning in different ways than subjects who are younger or have lower verbal ability (e.g., Daalen-Kapteijns & Elshout-Mohr, 1981; Daneman & Green, 1986; McKeown, 1985; Quealy, 1969; Werner & Kaplan, 1952).

In an attempt to determine which factors are the most salient in the guessing process, Quealy (1969) conducted a modified replication of the Ames (1966) study. Quealy (1969)
grouped 72 high school students according to grade level, gender, and verbal ability. Only the verbal ability factor reflected a significant difference for the amount of words guessed from context.

Age and verbal ability have also been examined in terms of processing differences.

Age Differences

Werner and Kaplan (1952) were among the first investigators to examine the effects of age on the ability to guess word meanings from context. They devised a task in which subjects ranging in age from 8 to 13 were presented with a neologism, an invented word, followed by six sentences using that word. The task was to guess the meaning on the basis of the contextual cues given. They found that performance improves gradually with age, the exception being a rather decisive shift between approximately 10 and 11 years of age.

These results are corroborated by Carnine et al. (1984), who found that older elementary L1 students were better able to derive meaning from contextual cues than younger students. Subjects of all ages, however, were able to give significantly more meanings to words presented in context than to words in isolation. In addition, all groups found the synonym clues easier to use than the contrast or inference clues.
Verbal Ability Differences

Daalen-Kapteijns and Elshout-Mohr (1981) used the Werner-Kaplan (1952) approach to investigate the inferencing processes of students divided according to verbal ability levels instead of age. Verbal ability level was determined by the combined scores of a multiple-choice and a word translation test. Sixteen Dutch college age subjects were exposed to three different neologisms, each presented in five different sentences. As the subjects thought aloud, the inferencing processes were observed. Generally, they all chose a familiar word for the neologism in a sentence, but different processes were observed in low- and high-verbal individuals as they encountered the neologism in different contexts.

The researchers classified these observed processes into two approaches--holistic and analytic. Analytic processors viewed the meaning as a bundle of components that could each be employed separately during the decontextualization process. Thus, the subjects modified rather than rejected the existing meaning if new incoming information appeared not to fit. Holistic processors, however, handled the model as an indivisible whole. These subjects were more dependent on the specific content of the sentences and less able to deal with conflicting new information. Results indicate that high-verbal subjects tend to process
semantic units analytically, whereas low-verbal subjects do so holistically.

McKeown (1986) also used a modification of the Werner and Kaplan (1952) approach in order to examine the inferencing processes of 30 elementary students at varying verbal ability levels. The subjects read a series of five contexts containing an artificial word. Each succeeding context gave additional meaning. High- and low-ability groups differed significantly in identifying the correct meaning with the low-ability group often misunderstanding the relationship between the artificial word and the context. Both groups, however, often demonstrated semantic interference when considering two contexts simultaneously.

Individual ability to exploit contextual cues has been examined yet another way by Daneman and Green (1986). They investigated working memory (i.e., the individual’s ability to process and store information) in relation to other abilities by correlating the following scores: reading scores, span test scores for working memory, scores on defining words in context, and scores of vocabulary knowledge. A correlation of .69 was found between scores on the ability to learn word meaning from context and those on the reading span test for working memory.
Contradictory Findings

Not all studies, however, support the above findings that students of varying verbal ability levels infer meaning differently. Kletzien (1991) found that good L1 comprehenders used approximately the same number and kinds of strategies as did poor comprehenders on easy cloze passages. As passage difficulty increased, however, the good comprehenders used more strategies and more kinds of strategies than the poor comprehenders. Likewise, Bensoussan and Laufer (1984) found that good L2 students did not guess differently than weak students. They simply knew more words to begin with. Furthermore, Nagy et al. (1987) did not find a significant effect of ability on learning from context in a study measuring the actual learning of unknown words through reading. The researchers minimized the unexpected results by stating, "We do not want to make too much of a negative finding, especially since studies of children's ability to derive word meanings from context consistently show effects of ability" (Nagy et al., 1987, p. 262).

In addition to these studies, which do not demonstrate significant differences by ability level on contextual learning, there are studies that question whether a significant amount correct guessing occurs regardless of ability level (e.g., Bensoussan & Laufer, 1984; Kelly, 1990; Laufer & Sim; 1981; Schatz
& Baldwin, 1986). Schatz and Baldwin (1986) have challenged the findings of the previously mentioned studies that support the facilitating effects of context. They contend that the words and the contexts used are not really representative of those encountered in reading. They point, for example, to the use of high-frequency word in cloze-type tasks (e.g., Carroll & Drum, 1982; Quealy, 1969) and argue that these results have been extrapolated to situations where low-frequency words occur. They further assert that the research literature is flawed by the use of contrived passages instead of naturally occurring prose (e.g., Carnine et al., 1984; Crist & Petrone, 1977; Gipe, 1979; Madison, Carroll, & Drum, 1982).

In order to determine the extent to which context really does help students infer meanings of unknown words, Schatz and Baldwin (1986) conducted three experiments. In the first, 101 high school students were randomly assigned to either a context or a no-context condition. The no-context group read low-frequency words in isolation while the context group read the same words embedded in passages taken from novels. The other two experiments were variations of the first, using different texts and different measures of meaning (i.e., having students write a definition rather than select the meaning from a multiple-choice format). No statistically significant effect was found relating to context in
any of the three experiments.

These results, however, have also been disputed, ironically, for not replicating the natural conditions that the researchers were purporting to achieve. According to critics, the reading contexts were neither naturally occurring, nor did they offer many cues (White, 1988). Although the researchers randomly selected 25 short passages, identifying a target word within each passage, they only used the sentence in which the word occurred along with two others. This procedure did allow for some inter-sentential cues, but much of the important context was omitted.

Several L2 studies also have produced results questioning the extent to which readers are able to make correct guesses. One finding has been that beginning L2 students often make incorrect guesses based on the form of the word rather than on the supporting context (Bensoussan & Laufer, 1984; Gibbons, 1940; Haynes, 1984).

Haynes (1984) interviewed English as a second language (ESL) students as they guessed the meanings of nonsense words that were placed strategically in a text for the purpose of comparing global versus local context cues. Although a major finding was that local context was more helpful than global cues, Haynes also found that incorrect guesses were usually based on graphic or phonemic mismatches.
This finding was corroborated by Bensoussan and Laufer (1984) in their investigation of 60 first-year ESL students. In order to establish baseline knowledge, subjects were given a list of 70 words to translate into their L1. A week later, they were given a copy of the same word list along with a text containing all of the words. An analysis of student answering patterns showed that context helped lexical guessing in only 13% of the responses for only 24% of the words. The most common reaction to the unknown words appeared to be to ignore them. The second most common reaction was to make an incorrect guess. Word guessability was shown to be less a function of using the context than of applying preconceived notions based on the structure of the word itself or its resemblance in sound or script to words in other languages. In order of decreasing frequency, the five word-guess patterns using preconceived notions were: (a) incorrect choice of a meaning of a polyseme, (b) mistranslation of a morphological troublemaker, (c) mistranslation of an idiom, (d) confusion with a synophone, and (e) confusion with a false cognate.

The Bensoussan and Laufer study (1984) corroborated and expanded upon the findings of Laufer and Sim (1981). Laufer and Sim concluded that learners make incorrect guesses based on word form because their vocabulary knowledge is so poor they cannot interpret the surrounding context. The only source of information
remaining, therefore, is the form of the unknown word.

Williamson (1989) concurs that incorrect guessing is common in L2 reading and offers several reasons for its occurrence: (a) First, in order for correct comprehension of word meaning to occur, certain cues and conditions must be present in the text (e.g., those outlined by Sternberg and Powell). (b) Second, guessing in FL is often more difficult than in L1 because of imperfect knowledge of the language, a shorter memory span (seen frequently in early stages of acquisition), and L1 interference. (See also Yorio, 1971, p. 108.)

Yet, it is precisely for these reasons that Kelly (1990) advocates guessing based on form (i.e., formal word features) over guessing based on surrounding context. Kelly's studies indicate that the most widespread kind of formal guessing involves root knowledge and cognates. Unlike the previously mentioned studies, however, Kelly's study found that these formal aids often assist the reader.

**Conclusion**

A number of studies support the ability of the reader to correctly guess meaning from context (Ames, 1966; Carnine et al., 1984; Carroll & Drum, 1983; Liu & Nation, 1984; Sternberg, 1983) and especially those readers with higher verbal ability (Daalen-Kapteijns & Elshout-Mohr, 1981; Daneman & Green, 1986;
McKeown, 1985; Quealy, 1969). Yet, another group of studies shows that readers are often unable to glean the meaning of an unknown word from a text (Bensoussan & Laufer, 1984; Haynes, 1983; Kelly, 1990; Laufer & Sim, 1981; Schatz & Baldwin, 1986). Part of the difficulty in interpreting the conflicting results is related to the use of different texts—some with artificial words or cloze-type blanks, others with artificially constructed paragraphs, and yet others with only a sentence for context. Research on deriving meaning using natural texts is notably lacking.

**Dictionary Usage to Determine Word Meaning**

Based on the results of several studies showing that context clues are often unreliable predictors of word meanings, some researchers state that L2 students should be allowed to use the dictionary rather than be forced to make a random guess (Bensoussan & Laufer, 1984; Haynes, 1983; Summers, 1987). Yet, dictionary use also has its critics. Rainsbury (1976) expresses the concerns of other L2 teachers as he discourages the use of dictionaries:

> Bilingual dictionaries are the places where the players of the synonym games get their ammunition. Dictionaries with definitions in the TL are often written with such exquisite care that it takes one who already knows the meaning of the word to understand
the definition (p. 199).

Similar reservations have been expressed about L1 dictionary use (Nagy, 1988).

Little empirical evidence exists, however, to support or to negate the use of dictionaries in learning new vocabulary, especially in L2. The relevant literature falls into two major categories: (a) vocabulary instruction comparisons using dictionary definitions as one of the methods and (b) the influence of dictionary use on reading comprehension. No studies were found investigating incidental vocabulary acquisition and dictionary usage, the main thrust of the present study. Yet, because most vocabulary instruction research involves either the use of definitions or the inference of meaning from context, major findings of pertinent studies will be examined.

In general, the practice of relying on the dictionary as the primary method of increasing students' vocabulary has not been substantiated by L1 research (Crist, 1981; Crist & Petrone, 1977; Eeds & Cockrum, 1985; Gipe, 1979). Crist and Petrone (1977) found significantly higher vocabulary scores for college students who derived the meaning of each unknown word from context than for subjects who read each definition five times. Crist replicated this study in 1981 using a single subject experiment methodology and achieved similar results.
Studies of elementary school students have reinforced these findings. Gipe (1979), for example, found that third and fourth graders learned the meanings of more unknown words from context than from the dictionary. She examined the effectiveness of four methods of teaching word meanings: (a) the association method--rote memorization of word-pairs; (b) the category method--adding of personally familiar words to a category including the target word; (c) the context method--utilizing target words in meaningful sentences; and (d) the dictionary method--looking up the definition of the target words. Results showed that the context method was significantly better than the other three methods for both grade levels.

Yet, these results need to be interpreted in light of the actual texts used. The context method, for example, could actually be considered a dictionary method as seen in the following context.

The barbarian kicked the dog and hit the owner in the nose. Any person who acts mean to anybody or to anything is a barbarian. Barbarian means a person who is very mean. Write down something that a barbarian might do at the dinner table (Gipe, 1979, p. 630).

Stahl (1983, 1985) has labeled what both Gipe (1979) and Crist and Petrone (1977) call a context method, a mixed method of instruction--one employing both definitional and contextual
information. In a meta-analysis of L1 vocabulary instruction studies, Stahl and Fairbanks (1986) conclude that this combination of definitional and contextual approaches is more effective than either approach in isolation. The yet untested L2 implication is that students would learn more new word meanings if they could see the words in context and also have dictionary access.

Stahl (1983, 1985) argues that in order to properly analyze the results of past instructional studies, one must separate the type of information provided (e.g., definitions, context, teacher explanation) from the processing requirements of the task itself. Stahl’s 1983 study was an attempt to equate the processing requirements of the two vocabulary treatments. Both the mixed and the definitional treatments required generative processing. The mixed method required students to generate sentences for each word while the definitional method required students to restate definitions in their own words. With processing level held equal, the mixed method resulted in significantly higher passage comprehension as measured by answers to six questions. Both methods, however, were equally effective on vocabulary learning as measured by cloze, sentence anomaly, and multiple-choice synonym tests.
Dictionary use has been examined in L2, but primarily for the purpose of determining its effect on reading comprehension. In one of the most cited studies, Bensoussan, Sim, and Weiss (1984) did three similar investigations using advanced English as a foreign language (ESL) students at Haifa and Ben Gurion Universities. In the first experiment, 91 students read texts in three different dictionary conditions: monolingual dictionary, bilingual dictionary, no dictionary. They read a passage and answered 10 multiple-choice questions to check comprehension. The passage was not removed during the testing of comprehension.

In the other two studies, subjects self-selected the condition of no dictionary, monolingual dictionary, or bilingual dictionary. Although results revealed a preference for the bilingual dictionary, no significant correlation appeared between dictionary use and reading comprehension scores. In fact, the better students used the dictionary less. Additionally, the better students were more likely to use the monolingual than the bilingual dictionary. Third-year students looked up more important words, while first-year students guessed less and looked up more words regardless of their importance to the text.

These results need to be interpreted with caution for two reasons. First, the use of multiple-choice tests as a valid measures for reading comprehension has been questioned. Bernhardt
(1991) points to the problematic nature of multiple-choice tests stating that not only are many questions independent of the passage, but also the questions and the distractors themselves may require additional comprehension, especially in L2. Text availability during testing only enhances these concerns. Second, the reliability and the validity of the dictionary-look-up procedure needs to be examined. Although the subjects were instructed to underline the words they looked up, the researchers admitted that "no attempt was made to check upon students' actual usage of the dictionary" (Bensoussan et al., 1981, p. 25).

Learning From Context

Research based on inferring meaning furnishes only a shaky basis for determining the amount of learning from context. Not only does the amount of learning remain unexamined, but the materials and tasks fail to achieve ecological validity (e.g., unnaturally informative context, use of non-words, focus of attention on the words themselves). But as Nagy et al. (1987) state, "this is not meant as a criticism of this research, for in general it was not conducted with the goal of assessing the contribution of incidental learning from content to children's overall vocabulary growth" (p. 238). A stronger foundation comes from studies where the learning hypothesis is explicitly stated.
How many words are actually learned from context? The highest estimate comes from results of Saragi, Nation, and Meister (1978), who found that 20 adult native English speakers were able to learn approximately 68% of the nadsat words (i.e., non-English slang) found in Clockwork Orange by Anthony Burgess. Twenty subjects read the novel at home and then took a multiple-choice synonym test over 90 of the 241 different nadsat words. The researchers claim that high scores reflect the ability to acquire meaning from reading. The high scores may also be attributed to other factors in the experiment, such as: (a) subjects--only highly literate adults were used; (b) word frequency--more than 50% of the words occurred 18 times or more; (c) word type--neologisms are not real words and by their very nature call attention to themselves.

To date, there have been four studies, all in L1, that directly examine incidental learning of actual words while reading--Jenkins et al. (1984), Konopak et al. (1987), Nagy et al. (1985), and Nagy et al. (1987). Jenkins et al. (1984) examined three major areas: (a) whether or not students learn the meaning of unfamiliar words incidentally while reading, (b) the number of presentations required to produce vocabulary learning, and (c) whether or not pre-exposure to word meanings influences vocabulary learning. One hundred twelve fifth graders, grouped according to
verbal ability level, read narrative passages constructed by the researchers. Ten separate paragraphs were written around each of the 18 selected low-frequency words. Subjects were exposed to one of four levels of occurrence: 0, 2, 6, or 10. Each paragraph provided a rich context, one that strongly implied the meaning of the target word as seen in the following example.

My aunt Rita's *avocation* is gardening. She works as a nurse at the local hospital 4 days a week. The other days she spends in her garden, weeding and planting and watering. Her hobby is very important to her. She is very proud of the vegetables she grows. She should be--they're delicious (Jenkins et al., 1984, p. 772).

Half of the unfamiliar words were informally taught before their appearance in the passage (i.e., pre-exposed condition). Dependent measures included a reading comprehension task (passage followed by multiple-choice questions) and three vocabulary measures (supply and select definition and sentence completion). Although word meanings were learned, the extent of learning depended on the frequency of the context presentation, reading ability, and prior exposure. Ten exposures gave the best results with vocabulary learning ranging between 16% and 27% over the baseline (zero exposure). Two exposures in rich contexts, however, produced no significant increases in learning.
Nagy et al. (1985) state that Jenkins et al. (1984) neither assessed small increments of word knowledge that often occur with only one textual encounter nor measured reading ability in normal contexts. To address these concerns, Nagy et al. (1985) had 57 eighth graders of average or above-average verbal ability read either a narrative or an expository text taken from grade-level school books. Each text was approximately 1,000 words long. Subjects were told that they would be tested on what they had read, but no further information about the purpose of the experiment was given. Fifteen minutes after the reading, subjects were tested on the 15 target words. These words had been selected by the teachers as being the most difficult in the text and, in addition, had been identified as unknown by the students in a yes/no vocabulary checklist task prior to reading.

After reading the passages, each subject completed an individual interview on the word meanings and a multiple-choice test constructed at three levels of difficulty for each word. A significant amount of learning from context was found with both measures at all levels of difficulty, though the absolute amount was small. The chance of a subject's learning a word was between .15 and .22 for the select-definition test and between .11 and .19 for the supply-definition test, depending on the level of question difficulty. Nonetheless, Nagy et al. (1985) argue that even a
small probability of learning a word from context can result in large-scale vocabulary growth, if given sufficient amount of wide reading.

Three shortcomings of the Nagy et al. (1985) study prevent broad generalization of results. First, the subjects were average or above-average eighth graders. As seen in other studies, students at different ages and different ability levels may derive meaning from context differently (e.g., Daalen-Kapteijns & Elshout-Mohr, 1981; Daneman & Green, 1986; McKeown, 1985; Quealy, 1969) Second, only two texts were used— one narrative and one expository. Third, because the students were tested immediately for knowledge, long-term gains were not assessed.

To address these concerns, Nagy et al. (1987) conducted another study. Three hundred fifty-two students in grades 3, 5, and 7 were grouped according to reading ability level and then randomly assigned to read either an expository or a narrative text selected for their grade levels. Again, a panel of teachers identified the 15 most difficult words from each text to be used as target words. Each subject read only two of the four texts at his or her grade level, but was tested on the target words from all four texts in order to determine the gain that could be attributed to learning from context. A delayed multiple-choice test was administered six days after the readings.
As in the first experiment, the principal finding was a small but significant effect of learning from context. Similar findings emerged for all grade and ability levels. The overall probability of learning a word to the criterion of selecting a definition was five percent, about one third the probability found with a similar test in the 1985 study. The researchers contribute this decrease to the six day delay in testing.

In addition to the analysis of subjects’ test scores, the effects of word and text properties on learning from context were also examined. Word properties included length, conceptual difficulty, morphological complexity, and part of speech. Text properties included the strength of contextual support for each word, readability, and density. Conceptual difficulty was the only word property significantly related to word learning. Regarding text properties, the proportion of unfamiliar words that were conceptually difficult and the average length of unfamiliar words were the most influential.

Konopak et al. (1987) attempted to extend the findings of Jenkins et al. (1984) and Nagy et al. (1985) to word learning in the content areas at the secondary school level. Sixty-five eleventh graders were first stratified according to scores on the reading subtest of the Stanford Test of Academic Skills and then randomly assigned to one of three groups: intentional learning,
incidental learning, or control. Both the intentional and incidental groups read a passage on United States history from which 10 target words had been selected. These words were underlined for the intentional group. In addition, this group was assigned a post-reading redefinition task while the incidental group worked on a nontopic puzzle. The control group read a newspaper article on a similar subject but not containing the target words.

The posttest was similar in format to the pretest. Students were to mark whether or not they knew the word and if they did, to provide a definition. Both experimental groups scored significantly higher on the post-definitional test than the control group. The scores of the intentional group were higher than those of the incidental group, though not significantly. The researchers contend that these results support the general hypothesis that word meanings can be acquired from reading.

Two aspects of this study, however, prevent generalization to all incidental vocabulary learning. First, the post-reading tasks for the intentional and incidental groups were different. That alone may have affected the scores. Second, the targeted words were selected not because they were representative of unknown words, but because they had strong contextual support (e.g., definition or synonym in the same or immediately following
sentence—much like Jenkins et al.'s constructed paragraphs).

The majority of these L1 studies imply that students are able to make consistent gains in vocabulary knowledge from encountering words while reading. Nagy and Herman (1987) conclude that although the absolute amount of learning is small (the chance of learning a word to any given criterion from one exposure in text is somewhere around 1 in 20), it must be evaluated in terms of its long-term effectiveness. They state,

If students were to spend 25 minutes a day reading at a rate of 200 words per minute for 200 days out of a year, they would read a million words of text annually... (encountering) between 15,000 and 30,000 unfamiliar words. If 1 in 20 is learned, the yearly gain in vocabulary will be between 750 and 1,500 words, or between a quarter and a half of the average child's annual vocabulary growth (p. 26).

Yet, the L2 situation is different. The average American university student has a passive vocabulary of about 60,000 lexical units, or 150,000 words. In order to begin to have this lexical range, a foreign student would have to learn, without forgetting, 40 lexical units a day, every day for over four years (Crow & Quigley, 1985, p. 498).

The only L2 study of incidental vocabulary learning found by this researcher is a dissertation by White (1988) that sought to duplicate the Saragi et al. (1978) L1 study. Two experiments were conducted in which a total of 51 adult ESL students read two
chapters of *Clockwork Orange*. Out of the 123 *nadsat* words that appeared in the two chapters, 30 were targeted for measurement.

In the first experiment, subjects were given instruction in how to guess meaning from context. Results of the multiple-choice test showed that an average of 1.8 word meanings or 6% of the total were acquired. Although the difference between these scores and the control group not reading the text were significant, learning gains were much smaller than expected. White cited possible causes as high level of text difficulty and lack of reader background knowledge. To address the second concern, another study was conducted in which subjects first viewed on video the scenes that preceded the reading. In this study, an average of 2.4 words meanings were acquired per subject or 8% of the total tested. This figure is considerably smaller than the 68% probability found in the Saragi et al. (1979) L1 study. White (1989), however, stated that the subjects' performance was underestimated because of four factors: (a) The text was not self-selected. (b) Not all unknown words in the text were tested. (c) The multiple-choice format had no context (i.e., single word). (d) The passage was difficult.

Results from this study cannot be used to predict how many words the intermediate level FL learner might incidentally acquire while reading an authentic text for several reasons. First,
according to the researchers, the text was too difficult for the students. Second, it was really a reading of two foreign languages--English and neologisms of Russian origin. Third, the average word appeared eight times. Only 2 of the 30 words appeared once. Fourth, the first study included instruction, thus focusing more on intentional learning. Fifth, the second study confounded vocabulary learning through reading with vocabulary learning through video in an attempt to provide background knowledge.

In conclusion, studies of L1 learning present evidence that young readers do acquire vocabulary incidentally through context. Although the number of words learned may be small, it is generally a significant amount. The L2 study seems to provide additional evidence that older students can learn vocabulary through reading. Whether or not this acquisition occurs incidentally in L2 and in texts without specially marked, or specially supported words, however, has yet to be determined.

Measures of Vocabulary Learning

Levels of Knowledge

What does it mean to know a word? Meara (1978) claims that knowing a word is "best described in behavioral terms as the ability to react to a word in ways which are considered
appropriate by the speech community" (p. 210). Yet, as Gass (1989) points out, not even native speakers react to all words in the same way. Although one definition or explanation may not be possible, all vocabulary experts seem to agree that learning word meaning is a gradual process; that a word is not simply unknown or known, but probably lies somewhere on a continuum ranging from loosely to strongly represented knowledge (Gass, 1989) or, as Nagy defines the continuum, from "I think I’ve seen that word before" to "That’s what I did my dissertation on" (Nagy, 1988, p. 4).

Another way of classifying vocabulary knowledge has been to distinguish between productive and receptive word knowledge--the first requiring careful, detailed knowledge of both the denotative and connotative meaning of words and the second, requiring only general denotative knowledge (Channell, 1988; Marzano & Marzano, 1988; Nattinger, 1988; Stern, 1983). Both of these divisions, however, can also be placed on the above loosely to strongly represented continuum.

Nation (1990) states that complete receptive knowledge of a word involves knowing the word's: (a) form (being able to recognize it when it is seen and to distinguish it from words with a similar form), (b) position (having an expectation of what grammatical pattern the word will occur in as well as of what words it will collocate with), (c) function (knowing whether it is
a frequently occurring word or a rare one and where the word can
be used appropriately), (d) meaning (being able to recall its
meaning and being able to see which shade of meaning is most
suitable for the context).

According to Nation (1990), complete productive knowledge of
a word includes receptive knowledge, but extends it to knowing how
to pronounce and write the word, how to use it in correct
grammatical patterns, and knowing with which words it usually
collocates. Possessing complete knowledge, therefore, applies to
only a small proportion of the total vocabulary of the average
native speaker.

"Word meanings are learned in different situations, to
different degrees of completeness, and with diverse learning
Thus, words learned in written context are usually initially
available only for receptive use—recognizing the word's general
meaning in a similar context. Although these meanings are not
very precise (Drum & Konopak, 1987), they do represent a level of
learning. It is this level that needs to be assessed when
determining if words are learned from context (Nagy et al., 1987;
Nagy et al., 1985).
Common Vocabulary Measures

Four basic types of test formats have been employed in attempts to assess breadth of vocabulary knowledge: (a) multiple choice; (b) constructed answer--the subject gives a definition, a synonym, an illustration, or uses the word in a sentence or phrase; (c) yes/no judgements--the subject checks the words in a list that he or she knows; and (d) matching--the subject matches words with their synonyms (Anderson & Freebody, 1981).

The multiple-choice format is currently the most widely used in standardized vocabulary testing (Anderson & Freebody, 1981, 1983). It has also been used in the majority of contextual learning studies to tap partial receptive knowledge (Jenkins et al., 1984; Nagy et al., 1987; White, 1988). As Anderson and Freebody (1982) state, however, the level of knowledge measured depends on the multiple-choice distractors. A problem common to many studies has been that measures of word knowledge were insensitive to small increments of learning (Nagy et al., 1985). Nagy et al. (1985) used a multiple-choice test with three levels of difficulty for each word. They found that distractors differing in general semantic categories were best able to tap minimal word knowledge. These findings have been corroborated by Herman, Anderson, Pearson, and Nagy (1987).
Although Craik and Tulving (1975) assert that words are best recalled if the original context can be re-established, that is not always possible. Using a sentence-completion multiple-choice test, one that reconstructs the original context, converts the test for learning into one for guessing. The problem still exists even if similar sentences are used. For these reasons, in vocabulary learning studies, the multiple-choice stem usually consists of the target word and no context.

Another widely used test for learning has been the constructed answer or supply definition (e.g., Jenkins et al., 1984; Konopak et al., 1987; Nagy & Anderson, 1987; Nagy et al., 1985). Whether or not minimal learning is measured depends on the scoring of the answer as seen in the differences between the results of Jenkins et al. (1984) and Nagy et al. (1985). Nagy et al. (1985) and Nagy and Anderson (1987) awarded partial credit for partial information using a three-point scale. Konopak et al. (1987) also evaluated responses according to levels of accuracy and completeness using a four-point scale.

Measuring Long-Term Retention

Regardless of the test used, researchers state that long-term learning must be measured (Nation, 1990). Past studies of retention (Anderson & Jordan, 1928; Seibert, 1927, 1930), support Pimsleur's (1967) vocabulary memory schedule, which shows
that most forgetting occurs immediately after initial learning and then, as time passes, the rate of forgetting decreases. Anderson and Jordan (1928) measured vocabulary retention over four time ranges: immediate, one week, three weeks, eight weeks. The percentages of material retained were 66%, 48%, 39%, and 37%, respectively. Most researchers agree that a delay of at least 24 hours--the point of maximum decline--is crucial (Nation, 1990).

**Reading Via the Computer**

In order to validate the dictionary condition--which words are actually accessed and how many times--the articles used in the present study were read on the computer screen. Generalizability of the results, however, depends on the extent to which reading a text displayed on the computer screen produces comprehension results similar to reading a text displayed conventionally, on printed pages.

Although several studies indicate that presenting a text electronically may increase comprehension (Anderson et al., 1974; Blohm, 1982; L'Allier, 1980; Reinking & Schreiner, 1985), there are also a few studies suggesting that computer presentation may have negative effects (e.g., Haas & Hayes, 1985; Heppner, Anderson, Farstrup, & Weiderman, 1985). Most research, however, has shown that no significant difference exits in comprehension
scores or in reading rates of students reading from traditional
texts and those reading from computer screens (Feldmann & Fish,
1987; Gambrell, Bradley, & McLaughlin, 1985; Gillingham, 1988;
Muter, Latremouille, Treurniet, & Beam, 1982; Reinking, 1988;

Gambrell et al. (1985), for example, found no significant
differences in reading comprehension and recall scores of third
and fifth graders due to the mode of presentation (computer
displayed or traditional text). These results are corroborated by
Reinking (1988) who found that elementary students at differing
ability levels were able to comprehend materials presented on the
computer as well as they comprehended materials from the printed
page. In addition, the time devoted to reading in each medium was
not statistically significant. Different reading times did
result, however, in a study by Muter et al. (1982) comparing adult
subjects in Sweden reading under the two conditions. The computer
group read 28% more slowly. The researchers offered several
explanations for this difference in rate, including the subjects’
lack of familiarity with video text, the length of the reading
time (i.e., two hours), and technical features that made the
presentation on the screen more restrictive than that of the book.
Their findings for comprehension, however, were not significantly
different for the print and computer groups.
Wepner and Feely (1987) found no statistical difference in either comprehension or reading time as college students read in the print and computer conditions. Their computer group, like the group of Muter et al. (1982), had the same initial disadvantage of no prior practice reading on the computer. Although the researchers admit that this may be a limitation, they state that American students in 1986 probably had more exposure to reading computer screens than had the adults in the Swedish study five years before.

Feldman and Fish (1987) extend the above findings to high school students of varying ability levels. No differences in performance were found according to medium. In information acquired from a questionnaire, both strong and weak students answered similarly on ease of reading from the screen and on keeping one's place on the screen. The researchers cite this as further support for the presentation of curriculum materials in either medium.

Student attitudes for reading on the computer have also been studied. Most investigations show that those using the computer show a greater interest in reading the text (Gambrell et al., 1985; Wepner & Feeley, 1987; Wepner et al., 1989).
Several studies have led to recommended procedures for presenting materials on the computer, procedures that the present study followed. According to studies by McConkie (1984) and Paisley and Chen (1982) the computer should be used for whole-text techniques--those that enable the reader to not only view the whole text in one display but also to have control over the rate of display. A general presentation guideline of the International Reading Association Computer Technology and Reading Committee (1984) is to display as many legible double-spaced lines as the screen will comfortably hold. This recommendation is substantiated by studies cited in Hooper and Hannafin (1986).

In summary, existing research has not found consistent differences in reading comprehension when computers are used to display text in a manner similar to its presentation on printed pages. Likewise, subjects of different ability levels appear to comprehend similarly on both mediums.

Conclusion

As evidenced in this review of literature and the current pedagogical practices discussed in Chapter I, a gap exists between what is known about incidental vocabulary learning and dictionary usage and what is advocated in the classroom. The gap exists because past research has given no clear answers to guessing from
context, to dictionary use, to learning new words through reading. Many of the past studies have used artificially constructed texts, texts that are too simple or too difficult, neologisms or blanks for target words, and measures of word learning and comprehension that are neither valid nor reliable.

The present study attempts to bridge this gap by investigating how college intermediate Spanish learners at two different verbal ability levels learn unknown words while reading authentic texts. The number of words accessed in the dictionary was electronically tabulated. The measures of learning were written to be sensitive to minimal knowledge and to test long-term retention.
CHAPTER III
PROCEDURES

Population and Sample

The population from which this study’s sample was drawn consisted of Spanish 201 students at Central Michigan University, a state university of approximately 17,000 students. General population descriptive statistics show that the average entering freshman has a high school grade point average of 3.2 and an ACT score of 21; that 98% of the students are residents of the State of Michigan, 80% return the following year, and 94% are full-time students.

Although the university has no general foreign language requirement, students pursuing a Bachelor of Arts degree are required to complete two years of a language. In 1991 approximately 1,400 students were enrolled in foreign languages, almost half of these in Spanish.

The sample drawn included students enrolled in Spanish 201 for the fall semester of 1991. Spanish 201 is an intermediate-level, third-semester course. The texts used are: *Continuemos* by Jarvis, Lebreo, and Mena; the accompanying
Laboratory Manual/Workbook by Jarvis, Lebrede, and Mena; and Aventuras literarias by Jarvis, Lebrede, and Mena. All three texts emphasize selected vocabulary for instruction. In addition to using the same texts, all sections of Spanish 201 use the same general syllabus.

Four sections of Spanish 201 were offered in the fall semester, each with approximately 28 students. All students were included in the study unless they were eliminated by results of the Checklist Vocabulary Test or withdrew from the class. The total number of eligible subjects was 105.

Research Design

The study used a three-factor ANOVA to answer research questions one through five. Two of these factors—high-/low-verbal ability and dictionary/no dictionary availability—were between subject, while exposure/no exposure to words was a within-subject factor. (See Table 1.) This two-between, one-within design enabled testing of both main effects and interaction among these three factors. Dependent variables were scores from the immediate- and delayed-vocabulary tests (both select and supply definition).
### Table 1

**Data Matrix for Three-Factor ANOVA Design (Dependent Variable: Vocabulary Scores)**

<table>
<thead>
<tr>
<th>(Level-A) (Method-B)</th>
<th>No Exposure (C1)</th>
<th>Exposure (C2) Immed/Delayed</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Dictionary (B1)</td>
<td>S1 (A1B1C1)</td>
<td>(A1B1C2)</td>
</tr>
<tr>
<td>High Ability (A1)</td>
<td>S2 (A1B1C1)</td>
<td>(A1B1C2)</td>
</tr>
<tr>
<td></td>
<td>S27 (A1B2C1)</td>
<td>(A1B2C2)</td>
</tr>
<tr>
<td>No Dictionary (B1)</td>
<td>S52 (A2B1C1)</td>
<td>(A2B1C2)</td>
</tr>
<tr>
<td>Low Ability (A2)</td>
<td>S53 (A2B1C1)</td>
<td>(A2B1C2)</td>
</tr>
</tbody>
</table>
A two-way ANOVA was used to answer research questions six and seven. Between-subject factors were dictionary/no dictionary access and high-/low-verbal ability. (See Table 2.) The dependent variable consisted of scores from the recall protocols. A correlation was performed on the vocabulary exposure scores and the recall scores in order to answer research questions eight and nine.

Table 2

Data Matrix for Two-Way ANOVA (Dependent Variable: Reading Comprehension Scores)

<table>
<thead>
<tr>
<th>Dictionary (A1)</th>
<th>No Dictionary (A2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Ability (B1)</td>
<td>S1 (A1B1)</td>
</tr>
<tr>
<td></td>
<td>S2 (A1B1)</td>
</tr>
<tr>
<td>Low Ability (B2)</td>
<td>S26 (A1B2)</td>
</tr>
<tr>
<td></td>
<td>S50 (A1B2)</td>
</tr>
</tbody>
</table>

Variables and Treatment Conditions

Random Variable: Text

Four texts were chosen on the basis of authenticity, length, topic, difficulty, and number of possible unknown words. Because part of the impetus of this study was based on discovering how the intermediate student learns with authentic materials (i.e.,
materials not prepared for instructional purposes), the articles were selected from actual Spanish magazines and newspapers. Each article was no longer than 250 words in length so that reading comprehension could be measured using a recall protocol (E. B. Bernhardt, personal communication, June, 1991). Articles exceeding the length requirement, therefore, were shortened. (See Appendix A for the four articles.)

In order to select the four final articles, several 201 instructors first read through 15 articles selected by the researcher and rated them according to difficulty, interest, and background knowledge. Each factor was judged on a five-point scale with three being average for the 201 level. Background knowledge was controlled by selecting topics that were common to the students, yet not predictable enough to give meaning clues without reading.

In addition to using the instructors' ratings, difficulty of text was also analyzed formally using the Lix formula (Schulz, 1981). The final four texts had readability ratings of: 43.3, 42.6, 45.6, and 40.9. (See Appendix B.) Based on these ratings, two text-sets were formed, each containing two readings. Text-Set I had a combined Lix average of 43.95 and Text-Set II, a Lix average of 43.24. The purpose of using of multiple texts with similar readability levels was to control for text type as an
intervening variable in the experiment as well as to control for comprehension floor and/or ceiling effects.

Each reading contained approximately 12 unknown words that had been targeted for measurement. Because subjects were randomly assigned to text-sets, each subject would encounter 24 unknown, targeted words while reading his/her text-set. The number of unknown words was based on findings of new-word density studies (Holley, 1973).

Independent Variables

Exposure/no-exposure to unknown words in text. The 48 words (i.e., 24 in each text-set) were chosen according to the following criteria: (a) selected as unknown by the 201 teachers, (b) not included in the 201/202 text glossary, and (c) checked as unknown by the subjects in the Checklist Vocabulary Test.

Each subject read only one text-set on the computer, but was tested on the target words from both text-sets. The scores in the no-exposure condition (test on words of opposite text-set) were then compared with the scores in the exposure condition (test on words read in their assigned text-set) to determine the gain that could be attributed to learning from context (Nagy et al., 1987).

Verbal ability. The second independent variable is learner verbal ability. It is a fixed, classification variable based on the verbal ACT scores of each subject. Scores were arranged in
descending order. The list was then divided in half--the top half becoming high-verbal ability and the bottom half, low-verbal ability. The 51 subjects in the high-verbal-ability group had an average verbal ACT score of 24.2 (standard deviation = 1.8). The 54 subjects in the low-verbal-ability group had an average score of 19.3 (standard deviation = 1.5).

Dictionary access/no-dictionary access. Students at each ability level were randomly assigned to either the dictionary access or the no-dictionary access condition. The subjects in the access condition were able to look up any word in the reading by simply pressing the designated lookup key on the computer (F4) and typing in the root form of the Spanish word. If they entered an incorrect form, the three words that would alphabetically precede the false entry in the dictionary as well as the three words that would succeed the entry were displayed on the screen along with instructions: "Word not found. Try one of these: ....." Once the correct root was supplied, however, the dictionary definition immediately appeared. The word accessed as well as the number of times it was looked up were recorded--thus providing an actual dictionary-use count for all the words in each passage.

The dictionary entries were based on definitions in the Harper Collins Spanish-English Dictionary and the Cassell diccionario esencial inglés-español español-ingles diáfora. The
part of speech along with basic definitions and idiomatic expressions were provided.

**Dependent Variables** (See Instrumentation.)

**Vocabulary tests.** The first dependent variable is vocabulary knowledge as measured by scores on the supply- and select-definition tests. These scores were recorded for each student in both the exposure and the non-exposure condition. Immediate as well as delayed tests were administered.

**Recall protocol.** The second dependent variable is reading comprehension as measured by scores on the recall protocols. The scores from each article were combined to give each subject one comprehension score for his/her assigned text-set.

**Instrumentation**

**Checklist Vocabulary Test**

A checklist test was developed based on the Yes/No Test of Anderson and Freebody (1983). Its sole purpose was to verify that the subjects did not know the targeted words. In this test, the subjects simply checked whether or not they knew the meaning of the word. In addition to the 48 unfamiliar words, 26 other words were chosen from a wide range of frequencies along with 6 non-words. (See Appendix C.)
This test was chosen because it gives the subjects no information about the meanings of the words they would encounter. According to Anderson and Freebody (1983), the test is sensitive to partial word knowledge because subjects tend to mark a word as known even if they have only a partial grasp of its meaning. In their study, the correlation between multiple-choice scores and corrected yes/no scores was .84. The correlation between responses on the yes/no test and words actually understood was .88, much higher than the multiple-choice test used.

A definition section was added to the self-report checklist to control for those subjects who indicate prior knowledge but who give inaccurate or incomplete meanings (e.g., Carroll & Drum, 1983; Konopak et al., 1987). Every subject who checked a word as known, therefore, also had to provide a brief definition for that word. Six subjects indicated partial knowledge of targeted, unknown words and were therefore eliminated from the study. (See Appendix D for the Checklist Vocabulary Tests.)

**Supply-Definition Test**

Subjects wrote a definition or gave an English equivalent for the 48 targeted unknown Spanish words. Scores for the 24 words encountered in reading (exposure condition) were recorded separately from those 24 not encountered in reading (no-exposure condition). Thus, subjects assigned to Text-Set I were first
administered a supply test on words appearing in Text-Set II for the no-exposure condition. Later, after reading Text-Set I, they were administered a supply-definition test over targeted words they had just encountered while reading. The supply-definition tests for Text-Set I and Text-Set II are found in Appendix E.

Two substantial problems with this type of constructed-answer measure are response bias and scoring of the answers (Anderson & Freebody, 1981). The response bias, however, is usually only seen in younger children who tend to provide concrete definitions through illustrations rather than by using an inclusive term or synonym (Anglin, 1970).

In order to diminish the scoring problem, three independent raters scored answers using a two-step scale. The following criteria were used to assess the responses: (a) zero points for an answer with no correct knowledge, (b) a half a point for an answer with partial knowledge, and (c) one point for a totally correct answer. Interrater reliability among the three raters was .97.

Select-Definition Test

In order to access the partial knowledge that subjects may have acquired after only one or several exposures, a multiple-choice or select-definition test was also administered. The major problem associated with multiple-choice tests is
deciding on the distractors. A different degree of discrimination is required if the choices are semantically similar than if they are semantically and syntactically different (Anderson & Freebody, 1981; Lepley, 1955, 1965). Because subtle distinctions between words are unlikely to be learned in one encounter, distractors were written to emphasize semantic differences. Distractors were similar, however, on a syntactic level.

All questions had five possible answers: the correct answer, three distractors, and a "don't know" option. Position of the correct answer was assigned in quasi-random fashion, occurring with equal frequency in the first four positions. The "don't know" option was always the fifth answer. (See Appendix F for select-definition tests for Text-Set I and II.)

Recall Protocol

The instrument used in assessing reading comprehension was the immediate recall protocol, a measure commonly used in L1 research. It has been called the "most straightforward assessment of the result of the text-reader interaction" by Johnston (1983, p.54) and "cognitive psychology's most powerful tool for tracking psychological process" by Hayes (1989, p. 69). Bernhardt (1983, 1991) concurs, pointing out that the recall reveals the integrated comprehension product of the student rather than features of the text selected by the teacher or researcher--factors seen in
multiple-choice and true/false tests. In addition, the protocol also avoids other validity problems found in multiple-choice and true/false tests, such as not being passage dependent.

The recall procedure recommended by Bernhardt (1991) is to tell the subjects that they may read the text as often as they like, and that when they are finished they will be asked to write everything that they remember from the text. The protocols are written in English so that the subjects' productive skills do not interfere with the subsequent analysis of their comprehension skills (Bernhardt & James, 1987; Lee, 1986).

**Scoring.** The immediate recall protocols were analyzed quantitatively using the Johnson System of weighted propositional analysis (1970). This system was chosen over the Meyer System because it is easier to score yet correlates highly with the Meyer method (Bernhardt, 1991).

The Johnson weighted propositional analysis is based on pausal units or breath groups. The researcher and three Spanish speakers first divided the articles into acceptable pause units and then ranked the units from one to four depending on their salience to the message of the text. Four points were given to the units having the greatest semantic significance and one point, to the least. (See Appendix G for Scoring Templates.)
The researcher and two trained raters scored the student protocols. Because each student wrote two protocols (i.e., two articles in each text-set), the scores were be combined in order to have one reading comprehension score per subject. Interrater reliability for the four texts averaged .95

Procedures and Data Collection

The procedures are divided according to whether they occurred before, during, or after the actual reading of the articles in the computer laboratory.

Pre-Experiment

Two weeks before the actual experiment, students were administered the Checklist Vocabulary Test so that the 48 targeted words could be validated as being unfamiliar. In addition, they also took the no-exposure supply and select tests on the 24 targeted words of the opposite text-set.

Experiment

The actual experiment was conducted in the computer laboratory at the end of November during regularly scheduled class periods. Subjects were told that the purpose of the experiment was to test for reading comprehension using authentic texts. They were directed to read each article for content and then write everything they could remember in English of what they had read.
No mention was made of the test for vocabulary learning. An overhead projector attached to the computer was used at the beginning of each session to give basic instructions on how to use the computer program. A brief instructional code, however, also appeared on the computer screen during the entire experiment.

Before the experiment, subjects at each ability level had been randomly assigned to either the dictionary or no-dictionary condition and to a specific text-set within that condition. Thus, 50% of the dictionary condition diskettes contained Text-Set I, the other 50%, Text-Set II. The same procedure was used for the no-dictionary condition. As students entered the lab, they were given their assigned diskette and proceeded to a computer station.

The basic procedure on all diskettes was the same. The subjects began by reading the first of the two texts, taking as much time as desired. When finished, they pressed the exit key. The text was then removed from the screen and subjects were presented with instructions for writing the first recall protocol. Those who preferred to write their recall by hand instead of on the computer were permitted to do so. Upon completing the recall, subjects read the second text and similarly wrote the second protocol. An unexpected vocabulary test (i.e., supply- and select-definition tests) followed the second recall protocol.
Again, subjects were given as much time as needed to complete the tasks. Whenever one section was completed and exited, it was not possible to return to that section.

Although the basic procedure for the dictionary/no dictionary conditions was the same, only the dictionary group was able to access the program's dictionary while reading the texts. After pushing the appropriate key (F4), subjects had to type in the base form of the word for which they wanted a meaning. The definition then appeared on the screen and remained until the dictionary-exit key was pushed.

As students completed the program, the information stored on their diskettes (i.e., test results, reading time, words looked up) was automatically printed out on the main-frame printer. Diskettes were collected as subjects left the lab.

Post-Experiment

A second vocabulary test, identical to the first supply-definition and select-definition tests, was given two weeks later to test for long-term retention.

Pilot Study

Pilot testing of the three phases outlined in Procedures and Data Collection took place at the beginning of the fall semester, 1991. The subjects in this study were 38 students enrolled in
Spanish 202. After careful scrutiny of all phases of the experiment, the researcher concluded that the procedures were generally acceptable.

Minor modifications were made in several areas: experiment time, tests, and the computer program itself. First, by having students report directly to the computer lab, an additional five minutes was gained for reading. Second, because no significant difference was noted between scores on the immediate test and the test given one week later, the delayed testing was extended to two weeks. Third, item analysis of the multiple-choice items led to the rewriting of several distractors. Fourth, several students encountered technical problems while trying to insert additional words into their recall protocols. Programming changes eliminated those problems. The pilot study also provided an opportunity to establish interrater reliability on the scoring of the supply-definition test and the recall protocols.

_data analysis_

An ANOVA was computed on the scores of the reading comprehension test and the vocabulary learning using the Generalized Linear Model procedure of the Statistical Analysis System. Data, as seen in Research Design, was entered accordingly. Appropriate post-hoc procedures were used to test
for significant differences. (See Appendix H for Subject Data Sheet Form.)

Null Hypotheses

**Ho1**  There will be no significant difference between the exposure and the no-exposure conditions on the results of the vocabulary learning measures.

**Ho2**  There will be no significant differences between low- and high-verbal-ability subjects on the vocabulary learning measures.

**Ho3**  There will be no significant difference between the dictionary access and no-dictionary access conditions on the scores of the vocabulary learning measures.

**Ho4**  There will be no interaction between ability level and method of learning new vocabulary (dictionary access/no-dictionary access) on vocabulary learning measures.

**Ho5**  There will be no significant difference between the immediate and delayed test scores on vocabulary measures.

**Ho6**  There will be no significant difference between the dictionary access/no dictionary access conditions on reading comprehension scores.
Ho7  There will be no significant interaction between ability level and dictionary access/no access on reading comprehension scores.

Ho8  There will be no correlation between reading comprehension scores and vocabulary learning scores.

Ho9  There will be no difference in correlations between comprehension and vocabulary scores for low- and high-verbal-ability students.
CHAPTER IV
RESULTS AND DISCUSSION

Introduction

In recent years, first language (L1) researchers have begun to investigate the long-standing hypothesis that a considerable amount of vocabulary is learned through reading. The results of four studies (Jenkins, Stein, & Wysocki, 1984; Konopok et al., 1987; Nagy, Anderson, & Herman, 1987; Nagy, Herman, & Anderson, 1985) indicate that students learn a small, yet statistically significant, amount of vocabulary incidentally while reading. Although this hypothesis has been extended to the second language (L2) realm, empirical evidence is lacking.

The purpose of the present study was to investigate whether or not college intermediate Spanish learners would learn a significant number of unknown words while reading authentic texts. Additionally, because some studies have demonstrated that readers with high verbal ability learn words differently than do those with low verbal ability, these factors were also examined. Furthermore, this study sought to examine the two strategies through which L2 readers might learn word meanings: guessing from
context or using a dictionary.

A two-between one-within subject design was chosen for the study. The between-factor independent variables included two levels of verbal ability (high and low) and two levels of reading condition (dictionary and no dictionary). The within factor was the presence of exposure (exposure and no exposure) to unknown words in written context.

The two levels of the independent variable of primary interest, exposure, were attained by testing each subject in two conditions: first, on 24 words not previously seen (no-exposure); and then, on 24 words just encountered in text (exposure). The difference in the two scores was used to determine the gain that could be attributed to learning from context (Nagy et al., 1987).

In order to obtain the two levels of the second independent variable, verbal ability, students were first stratified according to American College Test (ACT) verbal ability scores. A median split of these scores was then used to determine the high and low groupings.

Subjects in each verbal-ability group were randomly assigned to either the dictionary or the no-dictionary reading condition, the third independent variable. Although all students read the assigned readings from the computer screen, only students in the dictionary condition had access to the computerized
dictionary. By pressing the lookup key and typing in the base form of the desired word, they were able to find the definition of any word in the article. The computer was programmed to tabulate words each subject looked up.

In addition to number of words looked up, the computer also recorded reading time for each passage. Both of these measures were designed as descriptive measures and were not considered part of the experimental design per se.

The dependent variables for incidental learning consisted of scores on two vocabulary tests: supply-definition and select-definition. Each measure tested the 24 previously unknown words in both the no-exposure and the exposure conditions (immediate and delayed). A total score of 24 points per measure was possible.

In order to assess intentional learning (i.e., reading comprehension), a 2 (verbal ability: high and low) x 2 (reading condition: dictionary and no dictionary) between ANOVA design was used. The dependent measure was the combined scores of the recall protocol for each text-set. Each proposition in the text was given a weighted score (from one to four points) according to its importance to the overall meaning of the text. (See Chapter III and Appendix G.) The recall protocols were examined for accurate provision of each valid proposition and awarded points.
accordingly. Scores for the two recalls per text-set were combined to yield one comprehension score. In Text-Set I, 0 to 295 points were possible; in Text-Set II, 0 to 298.

The ANOVA appropriate to the designs was computed using the Generalized Linear Model procedure of the Statistical Analysis System at Central Michigan University.

Data Analysis

The purpose of this chapter is to report the analyses of the data. Results will be appear in three different sections, each section based on a specific analysis of different dependent variables:

1. ANOVA of vocabulary measures to determine incidental learning (Null Hypotheses 1 - 5)
2. ANOVA of reading comprehension recalls scores to determine intentional learning (Null Hypotheses 6 - 7)
3. Pearson correlation coefficients of vocabulary and recall scores to compare incidental and intentional learning (i.e., Null Hypotheses 8 - 9).

In each section, overall descriptive and inferential data will precede the specific results for each null hypothesis.
Incidental Learning

Descriptive data. In order to determine whether or not subjects learned vocabulary from context while focusing on meaning, two types of vocabulary measures were used: supply definition and select definition. All 105 subjects were administered these tests under two different conditions: no-exposure and exposure. In the no-exposure condition, subjects were given the two tests over words they had never seen. In the exposure condition, subjects first read the text in which these words appeared and then were tested. Supply and select tests were given immediately following the reading (i.e., immediate testing) as well as two weeks later (i.e., delayed testing). To determine learning from context, supply and select scores from the no-exposure condition were compared to supply and select scores from the exposure condition during immediate as well as delayed testing. All tests had 24 possible points.

Table 3 presents the means and standard deviations for the no-exposure (N = 105) and the exposure condition (N = 105) on immediate supply tests. The overall no-exposure condition mean was .15 and the standard deviation, .54. The overall exposure condition mean was 3.38 and the standard deviation, 2.71. Within the exposure condition, the dictionary group (n = 54) scored higher than the no-dictionary group (n = 51) with respective means
of 4.95 and 1.72. In addition, the high-verbal ability group (n = 51) attained higher vocabulary scores than did the low-verbal ability group (n = 54) with respective means of 3.80 and 2.98.

Table 4 presents descriptive data for the three independent variables on the delayed supply-definition test. Again, the overall exposure condition mean of 2.86 (SD = 2.22) was higher than the no-exposure mean of .15. The dictionary group mean was 3.37 (SD = 2.38) and the no-dictionary mean, 2.30 (SD = 1.90). After being exposed to the words in context, the mean score for the high-verbal ability group was 3.29 (SD = 2.12) and for low, 2.44 (SD = 2.24).

Table 5 reports descriptive data based on the immediate select-definition test. The exposure score mean was 11.73 (SD = 4.93); the no-exposure mean, 1.80 (SD = 1.81). Within the exposure condition, the dictionary group scored higher than the no-dictionary group (M = 14.56, SD = 4.49; M = 8.75, SD = 3.38, respectively). The overall high-verbal ability mean was 12.86 (SD = 4.52) and the low, 10.67 (SD = 5.10).

Table 6 contains the data resulting from the delayed select-definition test. As with the other measures, the exposure mean of 10.20 (SD = 4.50) surpasses the no-exposure mean of 1.80 (SD = 1.81). The dictionary condition mean (M = 12.24, SD = 4.33) was higher than the no-dictionary (M = 8.06, SD = 3.61).
Table 3
Means and Standard Deviations of Immediate Supply-Definition Vocabulary Scores as a Function of Exposure, Ability Level, and Dictionary Condition

<table>
<thead>
<tr>
<th></th>
<th>No-Exposure</th>
<th>Exposure (Immediate Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dictionary</td>
<td>No Dictionary</td>
</tr>
<tr>
<td></td>
<td>mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>High Verbal Ability</td>
<td>.25</td>
<td>(.72)</td>
</tr>
<tr>
<td>(n=51)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Verbal Ability</td>
<td>.07</td>
<td>(.26)</td>
</tr>
<tr>
<td>(n=54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OVERALL</td>
<td>.15</td>
<td>(.54)</td>
</tr>
<tr>
<td>(N=105)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 4

Means and Standard Deviations of Delayed Supply-Definition Vocabulary Scores as a Function of Exposure, Ability Level, and Dictionary Condition

<table>
<thead>
<tr>
<th></th>
<th>No-Exposure</th>
<th>Exposure (Delayed Test)</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>S.D.</td>
<td>Dictionary</td>
<td>No Dictionary</td>
<td>OVERALL</td>
</tr>
<tr>
<td>High Verbal Ability</td>
<td>.25 (.72)</td>
<td></td>
<td>3.44 (2.32)</td>
<td>3.13 (1.91)</td>
<td>3.29 (2.12)</td>
</tr>
<tr>
<td>(n=51)</td>
<td></td>
<td></td>
<td>(n=27)</td>
<td>(n=24)</td>
<td>(n=51)</td>
</tr>
<tr>
<td>Low Verbal Ability</td>
<td>.07 (.26)</td>
<td></td>
<td>3.31 (2.48)</td>
<td>1.57 (1.59)</td>
<td>2.44 (2.24)</td>
</tr>
<tr>
<td>(n=54)</td>
<td></td>
<td></td>
<td>(n=27)</td>
<td>(n=27)</td>
<td>(n=54)</td>
</tr>
<tr>
<td>OVERALL</td>
<td>.15 (.54)</td>
<td></td>
<td>3.37 (2.38)</td>
<td>2.30 (1.90)</td>
<td>2.86 (2.22)</td>
</tr>
<tr>
<td>(N=105)</td>
<td></td>
<td></td>
<td>(n=54)</td>
<td>(n=51)</td>
<td>(N=105)</td>
</tr>
</tbody>
</table>
## Table 5

**Means and Standard Deviations of Immediate Select-Definition Vocabulary Scores as a Function of Exposure, Ability Level, and Dictionary Condition**

<table>
<thead>
<tr>
<th>No-Exposure</th>
<th>Exposure (Immediate Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dictionary</td>
</tr>
<tr>
<td></td>
<td>mean</td>
</tr>
<tr>
<td>High Verbal Ability</td>
<td>1.88 (1.68)</td>
</tr>
<tr>
<td>Low Verbal Ability</td>
<td>1.74 (1.94)</td>
</tr>
<tr>
<td>OVERALL</td>
<td>1.80 (1.81)</td>
</tr>
</tbody>
</table>
Table 6

Means and Standard Deviations of Delayed Select-Definition Vocabulary Scores as a Function of Exposure, Ability Level, and Dictionary Condition

<table>
<thead>
<tr>
<th></th>
<th>No-Exposure</th>
<th>Exposure (Delayed Test)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dictionary</td>
</tr>
<tr>
<td></td>
<td>mean S.D.</td>
<td>mean S.D.</td>
</tr>
<tr>
<td>High Verbal Ability</td>
<td>1.88 (1.68)</td>
<td>13.48 (4.34)</td>
</tr>
<tr>
<td>(n=51)</td>
<td>(n=27)</td>
<td>(n=24)</td>
</tr>
<tr>
<td>Low Verbal Ability</td>
<td>1.74 (1.94)</td>
<td>11.00 (4.04)</td>
</tr>
<tr>
<td>(n=54)</td>
<td>(n=27)</td>
<td>(n=27)</td>
</tr>
<tr>
<td>OVERALL</td>
<td>1.80 (1.81)</td>
<td>12.24 (4.33)</td>
</tr>
<tr>
<td>(N=105)</td>
<td>(n=54)</td>
<td>(n=51)</td>
</tr>
</tbody>
</table>
High-verbal-ability subjects scored higher ($M = 11.80, SD = 4.20$) than low-verbal-ability subjects ($M = 8.70, SD = 4.29$).

In summary, the tables demonstrate that regardless of type of vocabulary measure or when the measure was administered, subjects in the exposure condition consistently scored higher than those in the no-exposure condition; those in the dictionary condition, higher than those in the no-dictionary condition; and those of higher-verbal ability, higher than those of lower-verbal ability.

**Inferential data.** The results of the factorial ANOVAs for the three-factor design according to type of vocabulary measure are summarized in Appendices I, J, K, and L. The main effects of all three independent variables proved to be significant on all four vocabulary measures, thus confirming the differences in means shown in Tables 3, 4, 5, and 6. Mean scores were deemed significantly higher for those exposed to passages ($p < .01$), for those in the dictionary condition ($p < .05$), and for those of high-verbal ability ($p < .05$).

In addition, the ANOVA resulted in two first-order interactions on the select-definition vocabulary measures (the exposure variable interacted with the dictionary variable and with the ability variable) and one first-order interaction on the supply-definition vocabulary measures (the exposure variable
interacted with the dictionary variable).

Following are the specific results for the first five null hypotheses, which are all based on vocabulary scores (i.e., incidental learning).

Hol: There will be no significant difference between the exposure and the no-exposure conditions on the results of vocabulary learning measures. This hypothesis must be rejected on the basis of the data. Figure 1 shows that the average score for the supply-definition test under the no-exposure condition was .15, while the average scores for the exposure condition in immediate and delayed testing were 3.38 and 2.86, respectively. The results of the between-within ANOVA in Appendix I revealed significant differences among no-exposure supply and immediate supply scores, \( F(1, 101) = 234.48, p = .0001 \), and in Appendix J, significant differences among no-exposure supply and delayed supply scores, \( F(1, 101) = 176.07, p = .0001 \).

The mean scores for the select-definition test are illustrated in Figure 2. The no-exposure mean of 1.8 differed significantly from the immediate mean of 11.73 (\( F(1, 101) = 531.03, p = .0001 \) and from the delayed mean of 10.21 (\( F(1, 101) = 414.10, p = .001 \)), as shown in the ANOVAs in Appendices K and L. A composite graph of supply and select means appears in Figure 3.
Figure 1. Means of Supply-Definition Vocabulary Measures for No-Exposure or Exposure to Words in Written Context
Figure 2. Means of Select Definition Vocabulary Measures for No-Exposure or Exposure to Words in Written Context.
Figure 3. Means of Supply and Select Vocabulary Measures for No Exposure or Exposure to Words in Written Context.
Although the differences in exposure/no-exposure means proved to be significant, this finding must be examined in terms the ability and dictionary variables because significant first-order interactions were noted on each of the four ANOVAs. (See Appendices I, J, K, and L.) On the supply scores, exposure interacted with dictionary on the immediate results: $F(1, 101) = 60.42$, $p = .0001$, and on the delayed results: $F(1, 101) = 6.55$, $p = .0120$. A comparison of pairwise means (Figure 4) indicated that although all subjects learned more words when they were exposed to them in context, those who had dictionary access learned the most. A Least Squares Means post-hoc test indicated that the no-exposure means were not significantly different from one another ($p = .9593$); yet, all other comparisons were significant at $p = .001$.

ANOVA summary tables for both immediate and delayed select-definition scores reveal two first-order interactions: exposure*dictionary (plotted in Figures 5 and 6) and exposure*ability (plotted in Figures 7 and 8). Again, the figures show that although subjects learned more words when they were exposed to them in context, those who had dictionary access learned the most. Similarly, Figures 7 and 8 demonstrate that high-ability students exposed to words in text learn more words than low-ability students presented the same words. All post-hoc test comparisons found the difference in no-exposures scores to be
Figure 4. Interaction Plot of Immediate and Delayed Supply-Definition Scores for the Exposure and Dictionary Conditions
Figure 5. Interaction Plot of Immediate Select Vocabulary Scores for the Exposure and Dictionary Conditions
Figure 6. Interaction Plot of Delayed Select-Vocabulary Scores for the Exposure and Dictionary Conditions
Figure 7. Interaction Plot of Immediate Select-Vocabulary Scores for the Exposure and Ability Conditions
Figure 8. Interaction Plot of Delayed Select-Vocabulary Scores for the Exposure and Ability Conditions
non significant and the difference in the exposure scores
significant on every measure.

**Ho2:** There will be no significant differences between low- and
high-verbal-ability subjects on the vocabulary learning measures.
Figure 9 illustrates the means of the various vocabulary measures
according to ability level.

As seen in Appendices I and J, the supply means differed
significantly for high- and low-verbal ability levels on immediate
supply ($F(1, 101) = 3.96, p=.0492$), and on delayed supply ($F(1,
101) = 5.35, p=.0228$). Differences were also significant on the
select measures: Immediate, $F(1, 101) = 7.16, p=.0087$; delayed,$F(1, 101) = 15.29, p=.0002$. The null hypothesis, therefore, must
be rejected.

**Ho3:** There will be no significant difference between the
dictionary access and no-dictionary access conditions on the
scores of the vocabulary learning measures. An examination of
Figure 10 shows a no-exposure supply score mean of .15.
Immediately after reading, however, those with dictionary access
achieved a mean score of 5.0 while those without access obtained a
mean score of 1.7. Two weeks later, the dictionary group mean was
3.4 and the no-dictionary group mean was 2.3. According to the
ANOVAs in Appendices I and J, the between-subjects variable was
significant on the immediate test, $F(1, 101) = 49.72, p=.0001$ and
Figure 9: Means of Vocabulary Measures by Verbal-Ability Level
Figure 10. Means of Vocabulary Measures by Dictionary Condition
on the delayed test, $F(1, 101) = 5.29, \ p = .0235$.

On the select measures, subjects having access to the dictionary had a mean score of 14.6 on the immediate test and 12.2 on the delayed test compared to the no-dictionary group with respective means of 8.8 and 8.1. According to the ANOVA results (Appendices K and L), these differences were also significant: immediate select, $F(1, 101) = 49.63, \ p = .0001$, and delayed select, $F(1, 101) = 26.37, \ p = .0001$. The null hypothesis of no significance is thus rejected.

$H_04$: There will be no interaction between ability level and dictionary condition on vocabulary learning measures. The ANOVAs for the immediate and delayed supply-definition and select-definition tests did not detect a significant interaction between the two between-subjects variables: (a) for supply definition administered immediately, $F(1, 101) = .06, \ p = .8035$; administered two weeks later, $F(1, 101) = 2.84, \ p = .0951$ and (b) for select definition administered immediately, $F(1, 101) = 1.01, \ p = .3182$; and two weeks later, $F(1, 101) = .60, \ p = .4413$. (See Appendices I - L.) The null hypothesis of no interaction is, therefore, retained.

$H_05$: There will be no significant difference between the immediate and delayed test scores on the vocabulary measures. Figure 3, page 92, graphically compares the overall means of the
immediate and delayed scores for supply definition and select
definition. The ANOVA summary in Appendix M indicates that the
supply mean of the immediate test, 3.38, was significantly
different from that of the delayed test, 2.86, with \( F(1, 101) =
5.33, p = .0230 \). The means of the select-definition tests
(immediate mean, 11.73; delayed mean, 10.21) were also
significantly different \( (p = .0001) \) as indicated in the ANOVA
summary shown in Appendix N. The null hypothesis of no
significance is therefore rejected.

These results, however, must be examined in light of the
significant first-order and second-order interactions. Dictionary
interacted with the time of testing (immediate/delayed) in both
supply definition and select definition, each having a significant
\( F \)-ratio at the \( p = .01 \). The ANOVA of the supply scores, however,
also revealed significant interaction between immediate-delayed,
dictionary, and ability \( (F\)-ratio significant at the \( p = .0411 \)
level).

A comparison of pairwise means for the select scores
according to dictionary-exposure cells (Figure 11) indicates that
although students using a dictionary learned and retained more
words than those gleaning meaning only from context, the
no-dictionary group exhibited less forgetting. Because cell sizes
were slightly unequal, a Least Squares Means post-hoc test was
conducted in order to determine whether or not these differences were significant. The results of this test indicated that the means of the dictionary/immediate (M = 14.5) and the dictionary/delayed (M = 12.2) were significantly different (p=.0001); however, those of the no-dictionary immediate (M = 8.8) and the no-dictionary delayed (M = 8.2) were not (p= 1381).

The second-order interaction found in the supply scores for immediate/delayed testing, ability level, and dictionary condition is depicted in Figures 12 and 13. Although high-verbal-ability subjects consistently scored higher than low-verbal-ability subjects, in the no-dictionary condition both groups scored higher on the delayed tests (high group M = 3.1; low group M = 1.6) than on the immediate tests (high group M = 2.0; low group M = 1.4). The results of the Least Squares Means post-hoc test posit statistically significant differences for the immediate and delayed means for high ability/no dictionary (p=.0123); for high ability/dictionary (p=.0001); for low ability/dictionary (p=.0040); but not for low ability/no dictionary (p=.7515). Thus, the decrease in scores from immediate to delayed testing is significant for the dictionary group of both verbal-ability levels. The unexpected increase in scores from immediate to delayed testing seen in both no-dictionary groups is significant only for the high-ability subjects.
Figure 11. Interaction Plot of Select-Definition Vocabulary Scores for Immediate-Delayed Tests and for Dictionary Condition
Figure 12. Interaction Plot of Supply-Definition Vocabulary Scores for Immediate and Delayed Tests with Dictionary Condition for High-Verbal-Ability Subjects
Figure 13. Interaction Plot of Supply-Definition Vocabulary Scores for Immediate and Delayed Tests with Dictionary Condition for Low-Verbal-Ability Subjects.
Intentional Learning

Descriptive data. Table 7 provides the means and standard deviations of reading comprehension scores for the dictionary condition and verbal-ability level.

Table 7

Means and Standard Deviations of Recall Scores as a Function of Ability Level, and Dictionary Condition

<table>
<thead>
<tr>
<th></th>
<th>Dictionary</th>
<th>No Dictionary</th>
<th>OVERALL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean</td>
<td>S.D.</td>
<td>mean</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Verbal Ability</td>
<td>80.33</td>
<td>27.42</td>
<td>67.83</td>
</tr>
<tr>
<td></td>
<td>(N = 27)</td>
<td></td>
<td>(N = 24)</td>
</tr>
<tr>
<td>Low Verbal Ability</td>
<td>67.70</td>
<td>26.14</td>
<td>46.70</td>
</tr>
<tr>
<td></td>
<td>(N = 27)</td>
<td></td>
<td>(N = 27)</td>
</tr>
<tr>
<td>OVERALL</td>
<td>74.01</td>
<td>27.29</td>
<td>56.65</td>
</tr>
<tr>
<td></td>
<td>(N = 54)</td>
<td></td>
<td>(N = 51)</td>
</tr>
</tbody>
</table>

Subjects who did not have access to the dictionary during reading scored lower (M = 56.65, SD = 23.35) on the recall measure than those subjects who had access (M = 74.01, SD = 27.29). In addition, those of higher verbal ability scored higher (M = 74.45, SD = 25.77) than those with lower verbal ability (M = 57.20, SD = 25.19). Low-verbal-ability subjects who had dictionary access scored similarly to high-verbal-ability subjects
with no access (\(M = 67.70, SD = 26.14\) and \(M = 67.83, SD = 22.54\), respectively).

**Inferential data.** The results of a factorial ANOVA for the two-factor design are summarized in Appendix 0. The main effects of both independent variables proved to be significant at the \(p < .01\) level.

Following are the specific results for each null hypothesis tested relating to intentional learning:

**H06:** There will be no significant difference between the dictionary access/no dictionary access conditions on reading comprehension scores. As seen in Table 7, the dictionary group had a reading comprehension mean of 74.01, while the no-dictionary group attained a mean of 56.65. The analysis of variance indicated a significant difference between the two means, \(F(1, 101) = 12.59, p = .0006\). The null hypothesis is therefore rejected.

Another ANOVA was performed on these reading comprehension scores but included Text-Set as an additional independent variable in order to verify that comprehension did not vary according to text. (See Appendix P.) Text-type was not significant, \(F(1, 98) = .11, p = .7393\). This finding validates the Lix Formula results of similar text readability as well as validates the significant findings for the dictionary condition on reading comprehension.
Ho7: There will be no significant interaction between ability level and dictionary access/no access on reading comprehension scores. The null hypothesis of no interaction between the two independent variables was retained, $F(1, 101) = .81, p=.3701.$

Incidental and Intentional Learning: Correlations

Following are the specific results for null hypotheses 8 and 9 based on correlations between the vocabulary and recall scores.

Ho8: There will be no correlation between reading comprehension scores and vocabulary learning scores. Table 8 presents the correlations between reading comprehension, as measured by recall scores, and vocabulary learning, as measured by the four vocabulary tests.

Table 8

Correlations Between Recall Scores and Vocabulary Scores

<table>
<thead>
<tr>
<th>Correlation with Recall</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Supply</td>
<td>.5339*</td>
</tr>
<tr>
<td>Immediate Select</td>
<td>.5468*</td>
</tr>
<tr>
<td>Delayed Supply</td>
<td>.3281*</td>
</tr>
<tr>
<td>Delayed Select</td>
<td>.5321*</td>
</tr>
</tbody>
</table>

$(N = 105)$ *$p<.01$
The correlations for reading comprehension and vocabulary as measured by the immediate administration of the supply- and select-definition tests were .5339 and .5468, respectively. For delayed administration, the correlations were .3209 for supply and .5321 for select. The null hypothesis is rejected.

Ho9: There will be no difference in correlations between comprehension and vocabulary scores for low- and high-ability students. Table 9 lists the correlations between recall scores and vocabulary scores according to ability level. The correlations are higher for low- than for high-verbal-ability subjects on every measure: (a) immediate supply, low-verbal ability was .6029 and high, .4264; (b) immediate select, low-verbal ability was .6559 and high, .3519; (c) delayed supply was .4056 for low-verbal ability and .1561 for high; (d) delayed select was .6825 for low-verbal ability and .2525 for high. The null hypothesis of no difference is rejected.

Table 9

Correlations of Recall Scores With Vocabulary Scores for High- and Low-Verbal-Ability Groups

<table>
<thead>
<tr>
<th></th>
<th>Immediate Supply</th>
<th>Immediate Select</th>
<th>Delayed Supply</th>
<th>Delayed Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Verbal Ability (N=54)</td>
<td>.6029*</td>
<td>.6559*</td>
<td>.4056*</td>
<td>.6825*</td>
</tr>
<tr>
<td>High Verbal Ability (N=51)</td>
<td>.4264*</td>
<td>.3519**</td>
<td>.1561</td>
<td>.2525**</td>
</tr>
</tbody>
</table>

*p<.01  **p<.05
Discussion and Additional Findings

Word Learning

As seen in the previous section, the ANOVAs on all four vocabulary measures indicated significant incidental learning of vocabulary through reading. When the two types of exposure were compared, subjects who had dictionary access scored significantly higher than those who did not have access. High-verbal-ability subjects also scored significantly higher than did low-verbal-ability subjects.

The purpose of collecting data on the no-exposure condition was to obtain a measure for guessing (i.e., How likely are these words to be guessed correctly if not seen in context?). In order to determine the percentage of words learned while reading under each of these conditions, the no-exposure mean score was subtracted from the exposure mean score and divided by the total number of words per test, which was 24 (Nagy et al., 1985). Table 10 summarizes the percentage results.

The table reveals that the select-definition test detected the learning of a greater number of words than the supply-definition test. This result was expected, however, because each test taps a different type or degree of learning. Normally, when a word is encountered once in context, the amount of learning that occurs is small—allowing only for recognition of
a similar definition rather than production (Deighton, 1959; Stahl, 1983). In this study, 43 of the 48 words appeared only once in the readings. (See Appendix C.)

Although the dictionary condition increased the percentage of words learned for both verbal-ability levels, it appeared to give the low-verbal ability group a special advantage. For example, on the immediate-select test the high group reading without dictionary access learned 35% of the words, while those with dictionaries learned 55%. The low group learned only 23% when reading without dictionaries but 51% when reading with dictionary access. The dictionary condition enabled the lower ability student to learn almost as many words as the high student in the same condition.

These percentages changed, however, when comparing delayed tests: high-verbal-ability students with dictionary access remembered 48% of the words two weeks later while low-verbal-ability students only remembered 39%. Yet, long-term memory is expected to be greater in high-ability students; the unexpected results are the similar percentages for the two groups for immediate learning in the dictionary condition.
Table 10

Percentage of Words Learned Incidentally

<table>
<thead>
<tr>
<th></th>
<th>SUPPLY</th>
<th></th>
<th>SELECT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Immediate</td>
<td>Delayed</td>
<td>Immediate</td>
</tr>
<tr>
<td>HIGH ABILITY</td>
<td>7%</td>
<td>11%</td>
<td>35%</td>
</tr>
<tr>
<td>NO DICTIONARY</td>
<td>5%</td>
<td>6%</td>
<td>23%</td>
</tr>
<tr>
<td>LOW ABILITY</td>
<td>21%</td>
<td>13%</td>
<td>55%</td>
</tr>
<tr>
<td>DICTIONARY</td>
<td>19%</td>
<td>14%</td>
<td>51%</td>
</tr>
</tbody>
</table>

(\% = percentage of words learned after corrected for guessing)

% = \# correct on Exposure test - \# correct on No-Exposure test

24 possible words
Another unusual finding is for the no-dictionary condition on immediate and delayed supply-definition tests. The high-verbal-ability group showed word learning of 7% on the immediate test and 11% on the delayed. The low-verbal-ability group revealed word learning of 5% on the immediate test and 6% on the delayed test. The statistical results given for Ho5, show a small, but overall significant, increase in scores after two weeks.

**Word Lookup**

The ANOVA failed to detect significant interaction among the between factors of verbal ability and dictionary on the vocabulary and comprehension measures. This finding indicates that the effect of the dictionary variable did not change according to subjects' verbal ability. Although it was initially assumed that those who had access to the dictionary would use the dictionary frequently, it was precisely to check this hypothesis that the computer was programmed to tabulate words actually looked up. The low-verbal-ability subjects accessed an average of 35.62 words per text-set while the high averaged 43.41 words.

Table 11 presents Pearson correlation coefficients between the number of words looked up and scores on the vocabulary and recall measures for subjects according to ability level. On the vocabulary measures, higher correlations emanated for select test
scores than for supply, for the low-verbal-ability student than for the high, for the recall measure than for the vocabulary measures. Generally, correlations can be considered high if they are above 0.6, medium if they are between 0.4 and 0.6, and low if they are below 0.4 (Kamil, Langer, & Shanahan, 1985).

Table 11

Number of Words Looked Up Correlated with Vocabulary and Recall Scores for High- and Low-Verbal-Ability Groups

<table>
<thead>
<tr>
<th>Vocabulary</th>
<th>Immediate Supply</th>
<th>Immediate Select</th>
<th>Delayed Supply</th>
<th>Delayed Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>.2422</td>
<td>.5430</td>
<td>-.0139</td>
<td>.5387</td>
</tr>
<tr>
<td></td>
<td>p=.2235</td>
<td>p=.0034</td>
<td>p=.9452</td>
<td>p=.0037</td>
</tr>
<tr>
<td>High</td>
<td>.1047</td>
<td>.3966</td>
<td>-.0042</td>
<td>.4845</td>
</tr>
<tr>
<td></td>
<td>p=.6031</td>
<td>p=.0405</td>
<td>p=.9835</td>
<td>p=.0104</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The correlation between recall scores and number of words looked-up for low-verbal-ability students (.6779) is much higher than that for high-verbal-ability subjects (.1697). The Coefficient of Determination (correlation squared) indicates that 46% of the variability in comprehension scores for low verbal subjects is accounted for by the number of words looked up; whereas, the percentage for high-verbal ability is only 3%.
On vocabulary measures, number of words looked up accounts for 29% of the variance in immediate select learning for low-verbal ability and only 16% for the high. For delayed select, the percentage is 29 for low and 23 for high. These percentages indicate that dictionary usage may play a more important role in vocabulary learning and reading comprehension for lower than for higher verbal-ability subjects.

Low-verbal subjects also had a higher correlation for vocabulary and recall scores, as seen in Table 8. Using the Coefficient of Determination to analyze the correlations for recall and delayed testing, the interdependence of scores for high-verbal-ability subjects is 2% for the supply and 6% for the select; whereas, for low-verbal-ability subjects the percentages are 16% for the supply and 47% for the select. Again, vocabulary knowledge is seen as a more powerful predictor of reading comprehension for low-verbal-ability subjects than for high.

**Reading Time**

In addition to recording the words solicited from the dictionary, the computer also recorded the reading time for each passage. These data, when combined with the mean vocabulary and recall scores, were used to produce time-learning comparisons for the different conditions. Overall means and standard deviations for time are presented in Table 12.
As noted in Table 12, the subjects in the dictionary condition spent more time on the passages ($M = 28.11$ minutes) than subjects in the no-dictionary condition ($M = 19.66$ minutes). This may have been time spent comprehending the passage, accessing the dictionary, or a combination of both. Because the dictionary-condition subjects also scored higher on the vocabulary and recall measures, the question becomes: Can the increase in learning be attributable simply to the increase in time? To determine this, the increase in time between the no-dictionary and the dictionary condition was calculated for each ability group. These percentages appear in Table 13 along with the increase in scores on the dependent measures that occurred between the no-dictionary and dictionary condition.

High-verbal-ability subjects with dictionary access spent 41% more time reading and looking up words than their no-dictionary counterparts. Only two of the dependent measures, however, exhibit an equal or greater increase than that of time—immediate supply-definition and immediate-select definition. Reading comprehension scores increased only 18%.

Low-verbal-ability subjects with dictionary access spent 46% more time in the reading mode than did their no-dictionary counterparts. Every dependent measure shows a similar or greater increase in learning. Thus, although reading comprehension
increases proportionally with time under this condition, the amount of vocabulary learned increases in greater proportion. This analysis of time on task demonstrates greater benefits for the low- than the high-verbal-ability students.

In summary, main effects were found on all three independent variables. When these significant differences for exposure to text, dictionary access, and verbal ability were examined in light of interactions and the additional findings provided by time and number of words looked up, the dictionary condition appears to have increased the scores of the low-verbal subjects proportionately more than those of the high-verbal subjects.
Table 12
Means and Standard Deviations for Reading Time According to Ability and Dictionary Condition

<table>
<thead>
<tr>
<th></th>
<th>No Dictionary</th>
<th>Dictionary</th>
<th>OVERALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>S.D.</td>
<td>Mean</td>
<td>S.D.</td>
</tr>
<tr>
<td>Low</td>
<td>18.92</td>
<td>5.38</td>
<td>27.29</td>
</tr>
<tr>
<td>High</td>
<td>20.49</td>
<td>4.89</td>
<td>28.95</td>
</tr>
<tr>
<td>OVERALL</td>
<td>19.66</td>
<td>5.16</td>
<td>28.11</td>
</tr>
</tbody>
</table>

Table 13
Percentage Increases in Time and Dependent Variable Scores from the No-Dictionary Condition to the Dictionary Condition for High- and Low-Verbal-Ability Groups

<table>
<thead>
<tr>
<th></th>
<th>Time</th>
<th>ImmSu</th>
<th>DeSu</th>
<th>ImmSe</th>
<th>DeSe</th>
<th>Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>41.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>44.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>166.8</th>
<th>9.9</th>
<th>49.1</th>
<th>35.9</th>
<th>18.4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>213.8</td>
<td>110.8</td>
<td>86.5</td>
<td>71.6</td>
<td>45.0</td>
</tr>
</tbody>
</table>
CHAPTER V
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Overview of the Study

The purpose of the present study was to investigate incidental learning of vocabulary while students focused on reading for meaning. One hundred five college intermediate Spanish learners of two different verbal-ability levels were randomly placed into two reading conditions: dictionary access or no-dictionary access. Fifty percent of the subjects in the dictionary condition read two articles in Text-Set I, while the other 50% read two different articles in Text-Set II. Students in the no-dictionary condition, likewise, were randomly assigned to either Text-Set I or Text-Set II.

The following procedures were used in data collections:

Two weeks prior to reading

Subjects assigned to Text-Set I or Text-Set II were given a checklist vocabulary test on the words in their specific text-set in order to validate that these words were indeed unknown. In addition, they were given supply- and select-definition vocabulary tests over the 24 words targeted in opposite text-set for the
no-exposure condition.

Reading and testing via the computer

Subjects read the two passages in their respective text-set. Those with dictionary access were able to look up the meaning of any word in a passage by pressing the lookup key and then typing in the root form of the desired word. After exiting each reading, subjects wrote recalls in English of everything they could remember. Following the last recall protocol, they were administered an unexpected supply- and select-definition vocabulary test over the 24 targeted words in their assigned text-set.

Two weeks after reading

Subjects took a delayed supply- and select-definition test over the same 24 targeted words encountered in their text-set in order to measure long-term retention.

Appropriate ANOVA and post-hoc tests were conducted on the dependent measures (i.e., vocabulary test scores and recall scores). Additional data were provided by simultaneous measures taken by the computer during reading and used for descriptive purposes. These measures included reading time and the number of words accessed in the dictionary.
Summary of Findings and Conclusions

Overview

Analyses of the experimental data revealed statistically significant main effects for all three independent variables on all four vocabulary measures (i.e., immediate supply and select; delayed supply and select). Regardless of type of vocabulary measure or when the measure was administered, subjects exposed to unknown words while reading consistently scored higher than those who were not exposed; those who had dictionary access, higher than those without access; and those of high-verbal ability, higher than those of low-verbal ability. Although no significant interaction was noted for the dictionary and the ability conditions, the number of words actually accessed correlated much higher with vocabulary scores for low- than for high-verbal-ability subjects.

Analysis of the reading comprehension scores also showed statistically significant main effects for the independent variables. Subjects in the dictionary condition and those in the high-verbal-ability group scored significantly higher than their no-dictionary and low-verbal-ability counterparts.

The relationship between incidental learning and intentional learning was examined using the Pearson product-moment correlation coefficient. Medium correlations (i.e., $r = .4$ to $r = .6$) were
found between recall scores and most of the vocabulary measures. When these same measures were divided according to the verbal-ability level of the subjects, however, the correlations increased for low-verbal ability and decreased for high-verbal ability.

Findings and conclusions will be discussed in three sections: (a) incidental learning of vocabulary, (b) intentional learning (i.e., reading comprehension), and (c) comparison of incidental and intentional learning. The additional findings of reading time and number of words looked up will be discussed under the appropriate section.

**Incidental Learning of Vocabulary**

**Main effects for exposure.** Main effects were detected for the exposure condition on all four vocabulary measures. This finding indicates that when subjects are tested on words read in context they score higher than when tested on words not previously seen in context. Although scores were much lower on supply tests than on select, both measures indicated significant learning because of exposure on both immediate and delayed tests.

Three significant first-order interactions emanated with the exposure variable: one involving the dictionary condition on the supply scores and two involving dictionary access and ability level on the select scores. Because no significant differences
appeared on any of the no-exposure scores during post-hoc testing, it can be assumed that the words were equally unknown to all subjects prior to treatment. Significant differences were noted, however, on both the supply and select exposure scores between those who had dictionary access and those who did not. Subjects in the dictionary condition learned more words. Likewise, on the exposure-select scores, subjects of high-verbal ability scored higher than those of low-verbal ability.

One way of evaluating the reliability of the present study is to compare these results to those of other incidental vocabulary-learning studies: (a) L1 studies--Jenkins, Stein, and Wysocki (1984); Konopak et al. (1987); Nagy, Anderson, and Herman, (1987); Nagy, Herman, and Anderson, (1985); Saragi, Nation, and Meister (1978), and (b) an L2 study--White (1988). (See Table 14.) Because the past studies have only examined learning from context without dictionary, the two methods of incidental learning are separated for comparative purposes.

One problem in comparing studies arises from different methods of measuring learning. All of the learning-from-context studies listed on Table 14, with the exception of Saragi et al. (1978), have used or been converted to the method proposed by Nagy et al. (1985 p. 248), which states that the probability of learning a word to a given criterion equals the increase in number
Table 14

Results Comparisons of Incidental-Vocabulary-Learning Studies

<table>
<thead>
<tr>
<th>Study:</th>
<th>Percent of Words Learned From:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Supply Immediate / Delayed</td>
<td>Select Immediate / Delayed</td>
<td></td>
</tr>
<tr>
<td>Saragi et al. 1978</td>
<td>.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jenkins et al. 1984</td>
<td>.05 (2 - 9 days)</td>
<td>.10 (2 - 9 days)</td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagy et al. easy = .19 1985 aver. = .15 (L1)</td>
<td>.20  .22</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>diff. = .11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Konopak el al. 1987</td>
<td>.09 (1 day)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nagy et al. 1987</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(L1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White 1989 (L2)</td>
<td>Study 1 = .06</td>
<td>Study 2 = .08</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knight 1992 (L2)</td>
<td>Hi Abil .07 .11 .35 .33 (2 weeks)</td>
<td>Low Abil .05 .06 .23 .20 (2 weeks)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Overall .06 .08 .29 .27</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2 weeks)</td>
<td></td>
</tr>
<tr>
<td>Dictionary:</td>
<td>Hi Abil .21 .13 .55 .48</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low Abil .19 .14 .51 .39</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total .20 .135 .53 .44 (2 weeks)</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
of words known to the given criterion divided by the number of words originally not known to that criterion. Thus, the number of words correct in the no-exposure condition was subtracted from the number correct in the exposure condition and divided by the original number of unknown words.

The Saragi et al. (1978) results could not be converted because no means were provided. The 68% listed in Table 14, therefore, is simply the percentage of words learned that was reported by the researchers. This figure is additionally skewed by the fact that 50% of the words appeared 18 times or more and only 2 of the 90 appeared once.

The Konopak et al. (1987) learning percentage (.09) was converted by this author and is based on mean information provided for the incidental and control groups with one exposure. From the description of the study, these measures appeared to be most comparable to the exposure/no-exposure groups in other studies.

The Nagy et al. 1985 study is most similar to the present study in several respects: (a) texts--authentic, not artificially constructed, (b) target words--unknown real words, the majority occurring only once, (c) vocabulary measures--use of both supply and select definition, and (d) no-exposure/exposure condition--based on similar tests.
Although Nagy et al. (1985) had questions at three levels of difficulty, their difficult supply and easy/average select would be comparable to the supply and select in the present study. Yet, even with these groupings, the Nagy et al. supply percentages are higher (.19 and .15) than those of the present study (.06), while select learning percentages are lower (Nagy et al., .20 and .22; Knight, .29). In addition to the obvious L1-L2 distinction, several possible explanations exist for these differences. Although the supply comparisons would indicate that Nagy et al.'s subjects learned words more thoroughly, it must be remembered that their supply test was an interview in which the interviewer prompted the subject to disclose all possible information.

The differences in select scores, which show greater learning in the present study, may be explained by the fact that college-age subjects are better able to derive meaning from context than younger subjects (Werner & Kaplan, 1952). Another explanation lies in the fact that 25% of the words in the Nagy et al. (1985) study were considered conceptually difficult, a word property factor that has been proven to be statistically significant in word-learning studies. In the present study, however, all 48 unknown Spanish words most likely represented a familiar L1 concept.
The glaring difference in learning percentage between the White (1988) L2 study and the present study (.07 versus .29 on select measures) is perhaps best explained in the Review of Literature. White's lower results may stem from: (a) a ceiling effect for passage difficulty, (b) insufficient time to finish reading the passage, and/or (c) testing of non-words.

In summary, the findings of the present study are consistent with similar L1 studies showing significant learning from context. The probability of learning a word to the extent that one could supply a definition immediately after reading is 6%; to the extent that one could select a definition, 29%. These results call in question the conclusions of Bensoussan and Laufer (1984), Kelly (1990), Schatz and Baldwin (1986), and others who contend that subjects do not learn word meaning from context in normal reading. This study has demonstrated statistically significant word learning on both supply and select measures for students reading authentic texts in which 95% of the words occurred only once.

Main effects for ability. As expected, high-verbal-ability subjects learned more words incidentally while reading than low-verbal-ability subjects. Significant differences were observed between their mean scores on all four vocabulary measures. These differences, however, were greater in the no-dictionary condition than in the dictionary condition. These
findings concur with those of other studies (e.g., McKeown, 1985; Quealy, 1969), showing that high-verbal-ability subjects are better able to glean meaning from context than low-verbal-ability subjects.

This advantage that high-verbal-ability subjects seemed to have in the no-dictionary condition was reduced when low-verbal-ability subjects were given dictionary access. Analysis of dictionary cell means showed no significant difference \((p<.01)\) for verbal-ability level on three tests (i.e., immediate and delayed supply tests; immediate select).

An explanation for these findings may be found in the results of studies showing that high- and low-verbal-ability subjects process information differently (e.g., Daalen-Kapteijns & Elshout-Mohr, 1981; Daneman & Green, 1986; Sternberg & Powell, 1983; Werner & Kaplan, 1952). For example, Daalen-Kapteijns and Elshout-Mohr (1981) discovered that college-aged, high-ability subjects tended to be more analytic, more capable of modifying word meaning as addition verbal clues came in. The low-verbal-ability group, on the other hand, processed information in a more holistic manner. New incoming information, therefore, tended to be rejected if it did not fit the existing model. The use of a dictionary, however, may have provided the low-verbal-ability subjects in this study enough information to reject or modify a
faulty holistic model.

**Main effects for dictionary.** Subjects in the dictionary condition learned more words as indicated by the results of the supply- and the select-definition test than those in the no-dictionary condition. The differences were deemed significant by an analysis of variance (ANOVA) of each measure for immediate and delayed testing. The percentage of words learned in each condition appears in Table 13. Two weeks after encountering the words in text, the dictionary group had learned 13.5% of the words compared to 8% for the no-dictionary group on supply measures; and 44%, compared to the no-dictionary 27% of the words on select measures.

These results seem to contradict L1 instruction studies purporting higher vocabulary scores for college students who derive meaning from context than those who use dictionaries (e.g., Crist & Petrone, 1977; Gipe, 1979). The findings, however, are consistent with those of Stahl (1983, 1985), which show that mixed methods (i.e., those providing both definitional and contextual information) produce significantly better vocabulary learning and have greater effects on measures of reading comprehension than do purely contextual or definitional approaches.
Significant interactions with immediate and delayed tests.

A significant first-order interaction was discovered on the select scores between the immediate-delayed testing and the dictionary condition. Students with dictionary access learned and retained significantly more words than those without access; however, those without exhibited less forgetting (i.e., no significant difference was found between the immediate and delayed scores).

A similar phenomenon was found on the supply tests for the no-dictionary condition. Examination of the second-order interaction between immediate/delayed testing, ability level, and dictionary condition showed a significant decrease in scores from immediate to delayed in the dictionary condition for both ability groups--a result that might well be expected. The unusual finding occurred in the no-dictionary condition: an increase in scores was noted for both the high- and low-ability groups on the delayed test, though only the means of the high-ability group proved to be significantly different.

Several possible explanations exist for why subjects would be unable to provide a definition immediately after seeing a word in context; yet, be able to do so two weeks later. One possibility is that subjects may have learned the meanings after leaving the test setting--either by discussing the results with other subjects or by accessing a dictionary. If this explanation
were correct, however, it seems that the select scores would have also improved in delayed testing. They did not.

Another possibility is that subjects had not learned the words well enough after the initial reading to supply a definition; however, upon seeing the words along with possible definitions on the succeeding select-definition section, they were able to identify the correct meaning. If so, the immediate select test functioned as a dictionary—enabling subjects to show productive knowledge two weeks later. Yet, this effect was only seen in the no-dictionary condition.

A third explanation is that this no-dictionary group had to process the information more deeply by making more elaborate connections between new and known information because they did not have dictionaries on which to rely. (See "Incidental Learning" in Theoretical Considerations for further discussion.) This depth of processing, which inhibited forgetting, may also have led to new associations as time elapsed. Supporting evidence for this hypothesis comes from the select scores. As previously noted, those in the no-dictionary condition exhibited some forgetting from the immediate to the delayed testing, but this difference was not significant as was the case for the dictionary group. This interpretation, however, must be tempered for two reasons: (a) Despite the fact that the no-dictionary group showed significant
forgetting between the immediate and delayed testing, their select delayed score mean was still 4.2 points above that of the no-dictionary group. (b) The supply scores for both groups were so low (e.g., highest cell mean was 5.4 words) that it would be an overgeneralization to conclude that learning increases over time when a dictionary is not use.

**Intentional Learning: Reading Comprehension**

**Main effects for dictionary.** The ANOVA indicated that the mean reading comprehension score of the dictionary group (74.01) was significantly higher than that of the no-dictionary group (56.65). These results contradict the findings of Bensoussan et al. (1984), the seminal L2 study of dictionary use and reading comprehension in which comprehension scores were not affected by use or non-use of dictionaries in three separate experiments.

These seemingly contradictory findings may stem from several differences between the two studies. In the Bensoussan et al. studies: (a) The ESL students were advanced (i.e., most had studied English for seven years). (b) Subjects in the second and third experiments self-selected the dictionary or no-dictionary condition. (c) Reading comprehension was measured using a multiple-choice test. (d) Subjects were allowed to examine the reading as they answered the questions. (e) No method was employed to validate whether or not words were actually looked up.
Of the stated possibilities, the probable cause for the no-significance finding in the Bensoussan et al. study is proficiency level of the subjects. Even the low-proficiency subjects had studied English for seven years and in the context of the present study would be considered advanced. The overall finding of no significance for the dictionary condition in the Bensoussan et al. study is similar to that of the present study—but only for the high-verbal-ability subjects. Recall scores for low-verbal-ability subjects in the dictionary/no-dictionary conditions were significantly different (p = .0026).

Partial explanation for this finding may come from Bernhardt's (1986) Constructivist Model, which describes reading as an interaction of text-based and extratext-based components. In addition to word recognition, other components are syntactic feature recognition, phonemic/graphemic features, prior knowledge, metacognition, and intratextual perception. Bernhardt (1991) has found that beginning readers have more comprehension errors based on word recognition than based on the other components. Yet, word recognition errors that can be attributed to vocabulary difficulties appear to decrease as L2 proficiency increases. Results of the present study and the Bensoussan et al. studies corroborate those findings. Additional support for this interpretation is found in the high correlation between reading
comprehension scores and number of words looked up for low-verbal-ability subjects ($r = .68$) and the relatively low correlation for high-verbal-ability subjects ($r = .17$).

When these low-verbal-ability subjects who seem to have problems with word recognition, however, are given dictionary access, their comprehension improves significantly. In fact, the use of the dictionary for the low-verbal-ability group brought their recall scores up to a level that was not considered significantly different from that of the high-verbal-ability group ($p = .0732$).

Two concerns have consistently surfaced with regard to dictionary use: disruption of short-term memory and increased reading time. If, however, disruptions of short-term memory did occur during lookup, it was not reflected on the reading comprehension scores. The concern is further dispelled by the high correlation found between the number of words looked up and recall scores for lower verbal-ability subjects.

A second factor of concern in dictionary use is the additional time needed for lookup. A high correlation was found between time to complete the readings and recall scores for the low-verbal-ability subjects ($r = .76$) and a low correlation ($r = .04$) for high-verbal-ability subjects. The finding for the high ability group concurred with that of Bensoussan et al. (1981).
The high correlation for the low-verbal ability group, however, coupled with the results of the time-comprehension ratios for the dictionary and no-dictionary conditions, provide evidence that the additional time spent by the low-verbal-ability group translated into similar increases in comprehension scores. This was not true for the high-ability group who showed a time increase of 41% and a corresponding comprehension increase of 18% from the no-dictionary to the dictionary condition.

**Comparisons Between Incidental and Intentional Learning**

The most interesting correlations between vocabulary and recall measures were found in relation to ability level. All correlations were higher for the low-verbal-ability group than for the high. On delayed vocabulary tests, correlations for high-verbal-ability subjects were $r = .16$ for supply and $r = .25$ for select; for low-verbal-ability subjects, $r = .41$ for supply and $r = .68$ for select. These findings serve as further evidence of the interdependence of vocabulary knowledge and reading comprehension for low-verbal-ability subjects at the intermediate FL level.

In conclusion, the results of the present study indicate that subjects did learn words incidentally while reading for meaning, but that they learned more words when given a dictionary than when they could only guess from context. Subjects with dictionary access also comprehended more of what they read than
those without dictionaries. On both vocabulary and recall measures, however, the positive effect of the dictionary was seen more for low-verbal-ability subjects. These findings carry important implications for foreign language pedagogical practices.

**Pedagogical Implications**

The three pedagogical questions that this research sought to answer were: (a) Can intermediate-level FL students learn a significant amount of new vocabulary through reading? (b) Should teachers encourage guessing or dictionary use while reading? (c) Should different approaches be encouraged for students of different verbal-ability levels?

Results have demonstrated that intermediate-level FL students reading short texts can indeed learn new words from context. The probability of learning a word while guessing from context ranged from 6% on supply measures to 29% on select measures. These percentages increased to 20% and 53% with dictionary use.

These findings, however, do not mean that words are learned more completely or more quickly through reading than through instruction, merely that significant incidental learning occurs. Many researchers have argued that direct instruction is more time effective (Beck, McCaslin, & McKeown, 1980; McKeown, Beck,
Omanson, & Perfetti, 1983). Yet, as Nagy et al. (1985) point out, any comparison of approaches ought to take into account that time spent reading has more benefits than just growth in vocabulary (e.g., pleasure and gains in general knowledge--benefits that direct vocabulary instruction cannot offer). The findings from this study indicate that reading is a viable way to increase vocabulary growth. The more teachers can encourage their students to read, the better the chance of that growth.

The second question addresses the widespread practice of advising students to guess the meaning of unknown words by using the written context and to refrain from using the dictionary (Haynes, 1983; Nation, 1990; Summers, 1988). The underlying assumption has been that looking up words interferes with short-term memory and thus impedes comprehension. The findings of this study, however, do not support those assumptions. Although dictionary entries were accessed via the computer, the process itself simulated actual dictionary use (i.e., in order to look up a word, students had to know the root form of an inflected word.) Subjects who used the dictionary not only achieved higher reading comprehension scores than those who guessed from context, but they also learned more words. Results of correlations between actual number of words looked up and recall scores reinforce the finding that comprehension does not suffer as a result of dictionary use.
This study indicates that the current practice of discouraging dictionary use while reading needs to be re-examined. Types of dictionaries (e.g., abridged or unabridged, monolingual or bilingual) and how to use them are two issues that should be part of any such re-examination.

The most evident pedagogical implications are perhaps those for learners of different verbal-ability levels. Low-verbal-ability subjects are at a disadvantage when they are simply told to guess from context. They are more dependent than high-ability subjects on vocabulary knowledge as seen in correlations between vocabulary scores and recall scores, between number of words looked-up and vocabulary scores, and between number of words looked-up and recall scores.

Additionally, although it was found that time increase caused by dictionary look-up may not be worthwhile in terms of high-verbal-ability vocabulary learning and comprehension results, it was definitely beneficial for those of low-verbal ability. These findings have even greater significance considering that high and low in this study were defined by a median split of all subjects. Had blocking occurred in three sections, including an average-verbal-ability group, the high and low differences may have been even greater. Again, based on the results of this study, dictionary use—especially for those of lower
verbal-ability--should not be discouraged. It should, in fact, be encouraged.

**Recommendations for Further Research**

Because this study is the first of its kind examining incidental learning of vocabulary with and without dictionary access, replications and enhanced experiments are certainly in order. This study has focused on college intermediate-level Spanish learners. Other studies are needed that involve subjects of different ages, different proficiency levels, and different languages. Rather than ability, other learner variables could be examined. One possibility might be locus of control. Given that high-verbal subjects looked-up more words than low-verbal-subjects but that their recall scores were not so highly correlated, did they look words up merely to self-check? Was the dictionary more of a psychological aid than a resource for unknown meaning?

In addition to varying the subjects, the study needs to be replicated using different texts. Because of restrictions imposed by the recall protocol procedure and by an hour-long class period, the readings, though authentic, were short. Will these same findings hold when longer texts are read? What will happen if the text is easier or more difficult, if it is narrative instead of expository, if the density of new words is increased or decreased?
All of these variables were tightly controlled in this experiment so that they would not interfere with the variables of primary interest. In order to increase generalizability of findings, however, these variables must also be manipulated.

The time of testing is another factor that needs further investigation. What would the delayed vocabulary results have been had there not been a test immediately following the reading or had the period of delay been extended?

The subjects in the dictionary condition had vocabulary and recall means that were significantly higher than those who could only guess from context. The dictionary used in the study was compiled using definitions from two general Spanish-English dictionaries, each containing approximately 50,000 entries. Although the most common meanings were given for every word, a more comprehensive dictionary might produce different results.

Qualitative studies are also needed. More questions must be answered involving the types of words learned, the strength of the contextual and mediating cues, and the importance of individual word meaning to the overall text meaning.
Limitations of the Study

The following limitations should be considered when examining the results of this study:

1 Text length: The text-sets contained 433 and 425 words respectively. A longer reading selection with a different density of unknown words may have made a difference in terms of number of words learned. Because of the length, subjects were able to re-read each article more than once, another factor that may have contributed positively to vocabulary results.

2 Recall: Despite the advantages that the recall protocol has in measuring overall reading comprehension, there is an inherent problem: It taps not only what the subjects recall but also how capable they are of writing down what they recall. Because subjects in the experiment were not familiar with this technique, they may have been somewhat disadvantaged.

3 Immediate and delayed testing: Both immediate and delayed vocabulary tests were administered in order to measure any initial as well as long-term learning. It is not known to what extent the immediate test influenced the scores on the delayed test, which took place only two weeks later. When compared to other measures of forgetting over time, these delayed scores do appear high.
Computer familiarity: In order to accommodate those who were less able to type, subjects were allowed to choose between writing recall protocols by hand or by computer. Although only 4 subjects out of the 105 wrote their recalls by hand, there was no such choice in terms of dictionary lookup. It is not know if typing familiarity affected the number of words looked up.

Despite the limitations that will occur in any empirical investigation, research of the kind reported in the present study is invaluable. Vocabulary acquisition--how it occurs and how it can be enhanced--is be an area of crucial importance to researchers, teachers, and students.
APPENDIX A

READING PASSAGES
Las Ballenas de Punta Mita

Cada año, entre diciembre y marzo, cientos de ballenas yubartas emigran para reproducirse en las aguas de Bahía de Banderas, México. Como muchas de las criaturas del mar, las ballenas han estado cubiertas por un velo de misterio durante siglos. Su enorme tamaño amedrentaba con frecuencia a los marinos de antaño, quienes las llamaban monstruos marinos.

El hecho de que la yubarta prefiera las aguas poco profundas para criar, la hace accesible a los investigadores y fácil de rastrear.

El periodo de gestación es de 12 meses y las ballenas gustan del clima cálido de México para dar a luz a sus crías. El recién nacido tiene baja resistencia al frío debido a que nace sin una capa de grasa que le proteja el cuerpo. Los primeros segundos de la existencia del bebé ballena dependen de que tome oportunamente su primera bocanada de aire, ya que nace bajo el agua.

Justo antes del nacimiento, varias hembras se reúnen alrededor de la ballena en trance de parto, listas para ayudarla. En cuanto el bebé nace, con la cola por delante y pesando alrededor de cuatro toneladas y media, las parteras, lo empujan inmediatamente a la superficie para que respire por primera vez.
La Fiesta De Los Negritos

Tocuaro es un pueblito con no más de 300 habitantes. Una tradición de este pueblo es el tallado de máscaras en madera que representan a sus antiguos dioses y personajes mitológicos. Los artesanos de este lugar dedican la mayor parte de su vida a este arte de tallar.

Según su leyenda el universo se divide en tres regiones: la región del cielo, la de la tierra y la de los muertos. En cada región hay un grupo de dioses; los más importantes son los de la primera que, simbolizados con máscaras y ataviados en sus coloridos disfraces, siempre tienen un motivo para la danza y la alegría.

En Tocuaro, cada 2 de febrero, se celebra esta famosa "fiesta de los negritos". Es una dramatización del levantamiento del niño Jesús, una lucha entre el bien y el mal escenificada con máscaras fantásticas.

El bien es representado por el arcángel san Miguel, guardián del niño Jesús, y sus protectores. Entre estos protectores se encuentran caporales, ermitaños y los "negritos".

El mal lo representan tres diablos llamados Astucia, Pecado y Luzbel. Entre carcajadas alborotan a los humanos y tientan al niño Jesús. Se libra entonces una terrible batalla. La gente observa como los tres demonios caen de pronto fulminados por el
arcángel san Miguel y son expulsados de la iglesia a las calles
donde continúan sus diabólicas travesuras.
Los Genios Del Hipódromo

A los 47 años de edad, el jinete puertorriqueño Angel Cordero, padre de cinco hijos, abuelo de una nieta y hombre sin canas, sigue siendo dueño y señor del espectáculo en la hípica americana.

Duro y fuerte como un roble, no cede frente a la edad y sigue triunfando en las pistas de Nueva York como lo hizo por vez primera hace 30 años, llevando su caballo siempre al frente. El año pasado, Cordero ganó $12,204,417 en galardones y hasta la fecha ha sumado más de 6,600 victorias, una cifra que sólo superan Willie Shoemaker y el panameño, Laffit Pincay.

Aun el mismo José Santos, líder de premios en los Estados Unidos, acepta que Cordero es el rey y él, su heredero. "Es un rey con la corona bien puesta" afirma Santos. "Ha sido consistente toda su vida. Su éxito no es un cuento de hadas". Cordero ha ganado tres veces el Kentucky Derby y ha sido considerado el mejor jinete de Saratoga, N.Y., durante 13 de las últimas 14 temporadas.

En la hípica americana más vale hablar español. Al amanecer, hora de entrenar y alimentar a los caballos, en los hipódromos se trabaja al son de la salsa o al ritmo de las rancheras. "Sin los hispanos no habría hipismo", afirma Jack
Bradley, entrenador nuyorquino. "A los muchachos americanos se les hace difícil mantener el peso."
Los Invencibles Maremotos

Monstruosas paredes de agua han devastado por años la costa pacífica de América del Sur. Estas gigantescas olas, conocidas como maremotos o "tsunami", son los hermanos de los terremotos.

El jueves 13 de agosto de 1868, dos grandes terremotos de una intensidad de 8.5 conmovieron cientos de kilómetros de territorio costero entre Chile y Perú. Estos temblores, sin precedentes originaron las ondas sísmicas más gigantescas que jamás hayan azotado las costas del Pacífico.

La cañonera norteamericana U.S.S. Wateree, que fondeaba en el puerto peruano de Arica, sobrevivió los dos terremotos sucesivos. El primero de ellos produjo sólo una "tsunami" de proporciones moderadas. Al tener un casco plano, la Wateree se mantuvo derecha y entera. Pero los otros navíos, de formas convencionales, habían quedado recostados sobre sus bordas, y no pudieron evitar ser inundados totalmente por las aguas cuando el mar volvió con la próxima ola gigante.

Según un testigo, la cañonera atravesó todo el pueblo descabezando algunos techos en su camino, hasta que la ola la depositó con toda la tripulación en sus puestos, temblando pero intacta. No podía creer que hasta el último marinero había salvado la vida, mientras los habitantes de la costa habían desaparecido casi por completo.
APPENDIX B

LIX FORMULA OF READABILITY AND DATA ON READING PASSAGES
LIX FORMULA OF READABILITY AND DATA ON READING PASSAGES

<table>
<thead>
<tr>
<th>ARTICLE AND SOURCE</th>
<th># WORDS</th>
<th>LIX FORMULA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEXT-SET I:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Las ballenas de Punta Mita&quot; 205 205 + 5100 = 45.3</td>
<td>Patricia Alisura Caminos del Aire, marzo, 1988</td>
<td></td>
</tr>
<tr>
<td>&quot;Tocuaro, la fiesta de los negritos&quot; 228 228 + 6000 = 42.6</td>
<td>Leticia Arriaga Stransky México desconocido, #168, 1991</td>
<td></td>
</tr>
</tbody>
</table>

| **TEXT-SET II:**  |         |             |
| "Los invencibles maremotos" 202 202 + 5500 = 45.6 | Michael J. Mooney Américas, (42), #4, 1990 |
| "Los genios del hipódromo" 223 223 + 4600 = 40.9 | Más, (2) #1, otoño 1990 |

LIX FORMULA:

\[
LIX = \frac{\text{NUMBER OF WORDS}}{\text{NUMBER OF SENTENCES}} + \frac{\text{NUMBER OF LONG WORDS}*}{\text{NUMBER OF WORDS}} \times 100
\]

(*= longer than 6 letters)

very easy text = 20 - 30
easy text = 35 - 40
average text = 45 - 50
difficult text = 55 - 60
very difficult = 65 - 70

LIX Average for Text-Set I = 43.95
LIX Average for Text-Set II = 43.25
APPENDIX C

LIST OF TARGETED UNKNOWN WORDS AND FREQUENCY OF OCCURRENCE
<table>
<thead>
<tr>
<th>Vocabulary from Text-Set I</th>
<th>Frequency</th>
<th>Variations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. la ballena-</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2. la yubarta-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. el parto-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. la bahía-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. dar a luz-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. la cría-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. la partera-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8. la tonelada-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9. la hembra-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10. amedrentar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11. rastrear-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12. el velo-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13. la bocanada-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>14. tallar-</td>
<td>1</td>
<td>(tallado - 1)</td>
</tr>
<tr>
<td>15. el disfraz-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16. el levantamiento-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17. labrar</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>18. la travesura-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19. fulminado, a-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>20. Tocuaro-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>21. tentar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22. alborotar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23. ataviado, a-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24. la carcajada-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Vocabulary from Text-Set II</td>
<td>Frequency</td>
<td>Variations</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
<td>------------</td>
</tr>
<tr>
<td>1. adiestrar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2. el jinete-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3. las canas-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4. el roble-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5. la pista-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6. la cifra-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7. el heredero-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8. el son-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>9. la hada-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10. el galardón-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>11. alimentar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>12. ceder-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>13. el hipismo-</td>
<td>1</td>
<td>(hipódromo - 2; hípica - 2)</td>
</tr>
<tr>
<td>14. el puesto-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>15. la tripulación-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>16. recostado, a-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>17. descabezando (descabazar)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>18. el casco-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>19. el maremoto-</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>20. la cañonera-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>21. atravesar-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>22. fondear-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>23. la onda-</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>24. azotado, a (azotar)</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX D

CHECKLIST VOCABULARY TESTS
CHECKLIST VOCABULARY

TEXT-SET I

NAME________________________
CLASS ------------------------

Place an "X" in front of the word if you know its meaning and then give any type of definition or English equivalent.

Place an "X" in front of the word if you know its meaning and then give any type of definition or English equivalent.

_1. la ballena =
_2. la lentaja
_3. el parto
_4. el árbol
_5. la cría
_6. la estrella
_7. la tonelada
_8. la hembra
_9. devolver
_10. el velo
_11. la bocanada
_12. la alcoba
_13. el disfraz
_14. labrar
_15. el levantamiento
_16. dar a luz
_17. el fango
_18. la travesura
_19. fulminado, a
_20. el arroz
_21. Tocuaro
_22. tentar
<table>
<thead>
<tr>
<th>Spanish word</th>
<th>English meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>23. nevar</td>
<td></td>
</tr>
<tr>
<td>24. alborotar</td>
<td></td>
</tr>
<tr>
<td>25. ataviado, a</td>
<td></td>
</tr>
<tr>
<td>26. fumar</td>
<td></td>
</tr>
<tr>
<td>27. el molino</td>
<td></td>
</tr>
<tr>
<td>28. la carcajada</td>
<td></td>
</tr>
<tr>
<td>29. leer</td>
<td></td>
</tr>
<tr>
<td>30. la yubarta</td>
<td></td>
</tr>
<tr>
<td>31. la bahía</td>
<td></td>
</tr>
<tr>
<td>32. alemán, a</td>
<td></td>
</tr>
<tr>
<td>33. dejar</td>
<td></td>
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<tr>
<td>34. la partera</td>
<td></td>
</tr>
<tr>
<td>35. la tojera</td>
<td></td>
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<tr>
<td>36. parar</td>
<td></td>
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<tr>
<td>37. amedrentar</td>
<td></td>
</tr>
<tr>
<td>38. rastrear</td>
<td></td>
</tr>
<tr>
<td>39. llemar</td>
<td></td>
</tr>
<tr>
<td>40. tallar</td>
<td></td>
</tr>
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</table>
CHECKLIST VOCABULARY

TEXT-SET II

NAME _____________________
CLASS _____________________

Place an "X" in front of the word if you know its meaning and then give any type of definition or English equivalent.

<table>
<thead>
<tr>
<th></th>
<th>Spanish word</th>
<th>English meaning</th>
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<tbody>
<tr>
<td>X</td>
<td>el baul</td>
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<td></td>
<td>el jinete</td>
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<td></td>
<td>escribir</td>
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<td></td>
<td>manatear</td>
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<td>fumar</td>
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<td>la pista</td>
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<td>asustar</td>
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<td>la hada</td>
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<td>llamar</td>
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<td>la cifra</td>
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<td>adiestrar</td>
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<td>alimentar</td>
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<td>el hipismo</td>
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<td>la paz</td>
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<td>atravesar</td>
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<td>azotado,a</td>
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<td>la nube</td>
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<td>la onda</td>
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<td>ceder</td>
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<td>el dinero</td>
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<tr>
<td>Number</td>
<td>Spanish word</td>
<td>English meaning</td>
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<td>25</td>
<td>el puesto</td>
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<td>26</td>
<td>el casco</td>
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<td>27</td>
<td>fondear</td>
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<td>28</td>
<td>la madera</td>
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<td>29</td>
<td>el galardón</td>
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<td>30</td>
<td>entredar</td>
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<td>31</td>
<td>la lentaja</td>
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<td>32</td>
<td>recostado, a</td>
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<td>33</td>
<td>el arroz</td>
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<td>34</td>
<td>la tripulación</td>
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<td>35</td>
<td>la cañonera</td>
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<td>36</td>
<td>la alcoba</td>
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<tr>
<td>37</td>
<td>descabezando (descabezare)</td>
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<tr>
<td>38</td>
<td>el maremoto</td>
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<td>39</td>
<td>descansar</td>
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<td>40</td>
<td>el son</td>
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APPENDIX E

SUPPLY-DEFINITION VOCABULARY TESTS
Write the English meaning of the Spanish word. If you do not know the meaning, leave a blank and proceed to the next word.

<table>
<thead>
<tr>
<th></th>
<th>Spanish word</th>
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<tbody>
<tr>
<td>1.</td>
<td>la ballena-</td>
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<td>2.</td>
<td>la yubarta-</td>
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<td>3.</td>
<td>el parto-</td>
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<td>4.</td>
<td>la bahía-</td>
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<td>5.</td>
<td>dar a luz-</td>
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<td>6.</td>
<td>la cría-</td>
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<td>7.</td>
<td>la partera-</td>
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<td>8.</td>
<td>la tonelada-</td>
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<td>9.</td>
<td>la hembra-</td>
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<td>10.</td>
<td>amedrentar-</td>
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<td>11.</td>
<td>rastrrear-</td>
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<td>12.</td>
<td>el velo-</td>
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<td>13.</td>
<td>la bocanada-</td>
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<td>14.</td>
<td>tallar-</td>
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<td>15.</td>
<td>el disfraz-</td>
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<td>16.</td>
<td>el levantamiento-</td>
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<td>17.</td>
<td>labrar-</td>
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<td>18.</td>
<td>la travesura-</td>
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<td>19.</td>
<td>fulminado, a-</td>
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<td>20.</td>
<td>Tocuaro-</td>
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<td>21.</td>
<td>tentar-</td>
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<td>22.</td>
<td>alborotar-</td>
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<td>23.</td>
<td>ataviado, a-</td>
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<tr>
<td>24.</td>
<td>la carcajada-</td>
<td></td>
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</tbody>
</table>
Write the English meaning of the Spanish word. If you do not know the meaning, leave a blank and proceed to the next word.

1. adiestrar-
2. el jinete-
3. las canas-
4. el roble-
5. la pista-
6. la cifra-
7. el heredero-
8. el son-
9. la hada-
10. el galardón-
11. alimentar-
12. ceder-
13. el hipismo-
14. el puesto-
15. la tripulación-
16. recostado, a-
17. descabezando (descabezalar)-
18. el casco-
19. el maremoto-
20. la cañonera-
21. atravesar-
22. fonsear-
23. la onda-
24. (hayán) azotado-
APPENDIX F

SELECT-DEFINITION VOCABULARY TESTS
This final section is a multiple-choice test of the same 24 words. Circle the correct English meaning of each Spanish word. If you do not know the meaning, circle the letter "e."

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<tbody>
<tr>
<td>a.</td>
<td>bailiff</td>
<td>a. party (political)</td>
<td>a. baptism</td>
<td>a. yoke (for oxen)</td>
<td>a. to shine on</td>
<td>a. packed, stuffed</td>
<td>a. the creed</td>
<td>a. to recede, retreat</td>
<td>a. to brighten, cheer</td>
<td>a. the midwife</td>
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<tr>
<td>b.</td>
<td>home base</td>
<td>b. delivery, childbirth</td>
<td>b. ship, vessel</td>
<td>b. mare</td>
<td>b. to give birth</td>
<td>b. stained, smudged</td>
<td>b. the suckling, young animal</td>
<td>b. to classify, assign a rating</td>
<td>b. the staple, clamp</td>
<td>b. the partner</td>
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<tr>
<td>c.</td>
<td>ballet</td>
<td>c. a very small piece</td>
<td>c. (sea) bay</td>
<td>c. humpback, finback</td>
<td>c. to give guidance</td>
<td>c. dressed, decked up</td>
<td>c. the servant, maid</td>
<td>c. to spread out, scatter</td>
<td>c. to frighten, scare</td>
<td>c. the departure</td>
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<tr>
<td>d.</td>
<td>whale</td>
<td>d. a partridge</td>
<td>d. a welcome</td>
<td>d. small vineyard</td>
<td>d. to find out</td>
<td>d. tied up, strapped in</td>
<td>d. judgement, criterion</td>
<td>d. to trail, trace, track</td>
<td>d. to correct, amend</td>
<td>d. the part time job</td>
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<td>e.</td>
<td>don’t know</td>
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<td>11. la tonelada</td>
<td>12. la hembra</td>
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<td>a. the keynote</td>
<td>a. hemophilia</td>
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<td>b. the ton</td>
<td>b. step sister</td>
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<td>c. the harmony</td>
<td>c. rust</td>
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<td>d. the tool box</td>
<td>d. female</td>
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<td>13. el velo</td>
<td>14. la bocanada</td>
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<td>a. the veil</td>
<td>a. swollen mouth</td>
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<td>b. the bandage, dressing</td>
<td>b. bog, marsh</td>
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<td>c. the candle</td>
<td>c. wine cellar</td>
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<td>d. the vein</td>
<td>d. mouthful, swallow</td>
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<td>15. tallar</td>
<td>16. el disfraz</td>
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<td>a. to make fit</td>
<td>a. disgrace</td>
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<td>b. to stagger, sway</td>
<td>b. fracture, break</td>
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<td>c. to carve</td>
<td>c. excuse, apology</td>
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<td>d. to add up, sum</td>
<td>d. disguise, costume</td>
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<td>17. el levantamiento</td>
<td>18. la travesura</td>
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<td>a. leverage, positional advantage</td>
<td>a. prank, mischief</td>
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<td>b. rebellion, uprising</td>
<td>b. crossing, cross street</td>
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<td>c. leaven, yeast</td>
<td>c. journey, course</td>
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<td>d. elevator</td>
<td>d. trauma, emotional or physical shock</td>
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<td>19. fulminado, a</td>
<td>20. labrar</td>
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<td>a. denounced severely, verbally chastised</td>
<td>a. to label, to identify</td>
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<td>b. escaped, fled</td>
<td>b. to plough, to till</td>
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<td>c. fused, melted down</td>
<td>c. to lament, to weep</td>
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<td>d. full, complete</td>
<td>d. to free, deliver, exempt</td>
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<td>21. la carcajada</td>
<td>22. alborotar</td>
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<td>a. prison, jail</td>
<td>a. to shelter</td>
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<td>b. snail, sea shell</td>
<td>b. to rejoice</td>
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<td>c. loud laugh, guffaw</td>
<td>c. to elaborate upon</td>
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<td>d. a malignant tumor</td>
<td>d. to agitate, stir up</td>
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<td>e. don’t know</td>
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</tbody>
</table>
23. Tocuaro
   a. a river in Spain
   b. a village in Mexico
   c. the name of an Aztec
   d. a Peruvian Indian tribe
   e. don’t know

24. tentar
   a. to transact, negotiate
   b. to spread out, stretch
   c. to tempt
   d. to request, plea
   e. don’t know
TEXT-SET II      SELECT VOCABULARY      NAME____________________

This final section is a multiple-choice test of the same 24 words.  
Circle the correct English meaning of each Spanish word. If you 
do not know the meaning, circle the letter "e."

1. el maremoto
   a. sea loin
   b. earthquake at sea
   c. large hole in the ground
   d. large deck on a ship
   e. don’t know

2. ceder
   a. to yield, give in
   b. to thirst
   c. to embarrass
   d. to shear; to harvest
   e. don’t know

3. la hada
   a. axe, hatchet
   b. haddock (type of fish)
   c. fairy
   d. stench, stink, bad smell
   e. don’t know

4. el puesto
   a. gateway
   b. sunset
   c. postage
   d. place, position
   e. don’t know

5. la tripulación
   a. the ability to stay afloat
   b. the after shock
   c. the crew of a ship
   d. tripartition, the division into three parts
   e. don’t know.

6. el hipismo
   a. hypnotism
   b. hiccups
   c. unkempt person
   d. art of horseback riding
   e. don’t know

7. atravesar
   a. to pass over, to go through
   b. to dare
   c. to be late
   d. to atrophy; to pull back
   e. don’t know

8. fondear
   a. to show affection
   b. to found, establish
   c. to stir up, arouse
   d. to cast anchor
   e. don’t know

9. descabezando
   a. dismounting
   b. cutting off the top of
   c. wounding in the head
   d. blowing apart
   e. don’t know.

10. recostado, a
    a. refurbished
    b. leaning, reclining
    c. paid in full
    d. covered
    e. don’t know
11. la cañonera
   a. type of bamboo
   b. a member of the clergy
   c. a gunboat
   d. a liturgical chant
   e. don’t know

12. la onda
   a. wave (seismic)
   b. a sling
   c. sense of honor
   d. deep pit
   e. don’t know

13. azotado
   a. colored blue
   b. hoed, dug up with a hoe
   c. choked, obstructed
   d. beaten, lashed (by rain, wind)
   e. don’t know

14. el jinete
   a. straw mattress
   b. a dog catcher
   c. sweet-almond paste
   d. jockey, rider
   e. don’t know

15. el casco
   a. a casket
   b. caste, race, breed
   c. the harvest, crop
   d. the hull of a boat
   e. don’t know

16. las canas
   a. baskets
   b. tweezers
   c. gray hair
   d. sugar cane
   e. don’t know

17. el roble
   a. robot
   b. oak, oak tree
   c. a stolen item
   d. rowboat
   e. don’t know

18. la pista
   a. a small pistol
   b. blow of a whistle
   c. race track
   d. a type of mushroom
   e. don’t know

19. la cifra
   a. figure, number
   b. cylinder
   c. quotation mark
   d. scarlet fever
   e. don’t know

20. el heredero
   a. groomer of horses
   b. a wound
   c. heir, inheritor
   d. heresy, lie
   e. don’t know

21. el son
   a. handkerchief
   b. sound (of an instrument
   c. corral for livestock
   d. male offspring
   e. don’t know

22. adiestrar
   a. to feed
   b. to straighten up
   c. to check, review
   d. to train
   e. don’t know
23. el galardón
   a. reward, recompense
   b. the leading man, suitor
   c. awning, canvas
   d. an enclosed narrow passageway
   e. don’t know

24. alimentar
   a. to eliminate
   b. to feed
   c. to cause to be ill
   d. to pledge support
   e. don’t know
Las Ballenas de Punta Mita

Cada año, entre diciembre y marzo, cientos de ballenas yubartas emigran para reproducirse en las aguas de Bahía de Banderas, México. Como muchas de las criaturas del mar, las ballenas han estado cubiertas por un velo de misterio durante siglos. Su enorme tamaño amedrentaba con frecuencia a los marineros de antaño, quienes las llamaban monstruos marinos. El hecho de que la yubarta prefiera las aguas poco profundas para criar, la hace accesible a los investigadores y fácil de rastrear. El período de gestación es de 12 meses y las ballenas.
gustan del clima cálido

de México

para dar a luz a sus crías.

El recién nacido

tiene baja resistencia al frío

debido a que nace

sin una capa de grasa

que le proteja el cuerpo.

Los primeros segundos

de la existencia del bebé ballena

dependen de que

tome oportunamente

su primera bocanada de aire,

ya que nace

bajo el agua.

Justo antes del nacimiento,

varias hembras

se reúnen alrededor de la ballena

en trance de parto,

listas para ayudarla.

En cuanto el bebé nace,

con la cola por delante

y pesando alrededor de cuatro toneladas y media,

las parteras,

lo empujan inmediatamente

a la superficie

para que respire

por primera vez.

144 = TOTAL POSSIBLE POINTS (4s=15; 3s=14; 2s=14; 1s=14)
La fiesta de los negritos ---------------------
Tocuaro -----------------------------
es un pueblito mexicano ---------------------
con no más de 300 habitantes. ---------------------
Una tradición ancestral de este pueblo ---------------------
es el tallado de máscaras ---------------------
en madera ---------------------
que representan a sus antiguos dioses ---------------------
y personajes mitológicos. ---------------------
Los artesanos de este lugar ---------------------
dedican la mayor parte de su vida ---------------------
a este arte de tallar ---------------------/además de labrar la tierra---------------------
Según su leyenda ---------------------
el universo se divide en tres regiones: ---------------------
la región del cielo ---------------------
la de la tierra ---------------------
y la de los muertos. ---------------------
En cada región ---------------------
hay un grupo de dioses; ---------------------
los más importantes son los de la primera que, ---------------------
simbolizados con máscaras ---------------------
y ataviados en sus coloridos disfraces, ---------------------
siempre tienen un motivo ---------------------
para la danza ---------------------
y la alegría. ---------------------
En Tocuaro, ---------------------
cada 2 de febrero, ---------------------
se celebra esta famosa "fiesta de los negritos".
Es una dramatización del levantamiento del niño Jesús, una lucha entre el bien y el mal escenificada con máscaras fantásticas. El bien es representado por el arcángel san Miguel, guardián del niño Jesús, y sus protectores. Entre estos protectores se encuentran caporales, ermitaños y los "negritos". El mal lo representan tres diablos llamados Astucia, Pecado y Luzbel. Entre carcajadas alborotan a los humanos y tientan al niño Jesús. Se libra entonces una terrible batalla. La gente observa como los tres demonios caen de pronto fulminados por el arcángel san Miguel y son expulsados de la iglesia.
a las calles

donde continúan sus diabólicas travesuras.

151 = TOTAL POSSIBLE POINTS (4s=15; 3s=15; 2s=15; 1s=16)
Los Genios Del Hipódromo
A los 47 años de edad,
el jinete puertorriqueño
Angel Cordero,
padre de cinco hijos,
abuelo de una nieta,
y hombre sin canas,
sigue siendo dueño
y señor
del espectáculo
en la hípica americana.
Duro y fuerte
como un roble,
no cede frente a la edad
y sigue triunfando
en las pistas de Nueva York
como lo hizo por vez primera
hace 30 años,
levantando su caballo
siempre al frente.
El año pasado,
Cordero ganó $12,204,417
en galardones
y hasta la fecha
ha sumado más de 6,600 victorias,
una cifra
que sólo superan
Willie Shoemaker
y el panameño,
Laffit Pincay.

Aun el mismo José Santos, líder de premios en los Estados Unidos, acepta que Cordero es el rey y él, su heredero.

"Es un rey con la corona bien puesta" afirma Santos.

"Ha sido consistente toda su vida. Su éxito no es un cuento de hadas".

Cordero ha ganado tres veces el Kentucky Derby y ha sido considerado el mejor jinete de Saratoga, N.Y., durante 13 de las últimas 14 temporadas.

En la hípica americana más vale hablar español.

Al amanecer, hora de adiestrar y alimentar a los caballos, en los hipódromos se trabaja al son de la salsa.
o al ritmo de las rancheras.

"Sin los hispanos no habría hipismo", afirma Jack Bradley, entrenador nuevayorquino. A los muchachos americanos se les hace difícil mantener el peso.

153 = TOTAL POSSIBLE POINTS (4s=17; 3s=17; 2s=17; 1s=16)
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<tr>
<td>4</td>
<td>Los invencibles maremotos</td>
</tr>
<tr>
<td>4</td>
<td>Monstruosas paredes de agua</td>
</tr>
<tr>
<td>3</td>
<td>han devastado por años</td>
</tr>
<tr>
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<td>la costa pacífica</td>
</tr>
<tr>
<td>4</td>
<td>de América del Sur.</td>
</tr>
<tr>
<td>4</td>
<td>Estas gigantescas olas,</td>
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<tr>
<td>4</td>
<td>conocidas como maremotos</td>
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<tr>
<td>2</td>
<td>o &quot;tsunami&quot;,</td>
</tr>
<tr>
<td>1</td>
<td>son los hermanos</td>
</tr>
<tr>
<td>2</td>
<td>de los terremotos.</td>
</tr>
<tr>
<td>1</td>
<td>El jueves</td>
</tr>
<tr>
<td>1</td>
<td>13 de agosto</td>
</tr>
<tr>
<td>3</td>
<td>de 1868,</td>
</tr>
<tr>
<td>4</td>
<td>dos grandes terremotos</td>
</tr>
<tr>
<td>2</td>
<td>de una intensidad de 8.5</td>
</tr>
<tr>
<td>3</td>
<td>conmovieron</td>
</tr>
<tr>
<td>3</td>
<td>cientos de kilómetros</td>
</tr>
<tr>
<td>2</td>
<td>de territorio costero</td>
</tr>
<tr>
<td>3</td>
<td>entre Chile y Perú.</td>
</tr>
<tr>
<td>2</td>
<td>Estos temblores,</td>
</tr>
<tr>
<td>1</td>
<td>sin precedentes</td>
</tr>
<tr>
<td>3</td>
<td>originaron las ondas sísmicas</td>
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<td>3</td>
<td>más gigantescas</td>
</tr>
<tr>
<td>1</td>
<td>que jamás hayan azotado</td>
</tr>
<tr>
<td>2</td>
<td>las costas del Pacífico.</td>
</tr>
<tr>
<td>4</td>
<td>La cañonera norteamericana</td>
</tr>
<tr>
<td>3</td>
<td>U.S.S. Wateree,</td>
</tr>
<tr>
<td>2</td>
<td>que fondeaba en el puerto peruano</td>
</tr>
<tr>
<td>1</td>
<td>de Arica,</td>
</tr>
</tbody>
</table>
sobrevivió los dos terremotos sucesivos.
El primero de ellos
produjo sólo una "tsunami"
de proporciones moderadas.

Al tener un casco plano,
la Wateree se mantuvo derecha y entera.

Pero los otros navíos,
de formas convencionales,
habían quedado recostados
sobre sus bordas,
y no pudieron evitar
ser inundados totalmente
por las aguas
cuando el mar volvió con la próxima ola gigante.

Según un testigo,
lá cañonera atravesó todo el pueblo
descabezando algunos techos en su camino,

hasta que la ola la depositó
con toda la tripulación en sus puestos,
templando pero intacta.

No podía creer
que hasta el último marinero
había salvado la vida,
mientras los habitantes de la costa-
habían desaparecido
casi por completo.

145 = TOTAL POSSIBLE POINTS (4s=14; 3s=15; 2s=15; 1s=14)
APPENDIX H

STUDENT DATA SHEET
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</table>
APPENDIX I

ANOVA OF SUPPLY-VOCABULARY SCORES BY EXPOSURE CONDITION (NO-EXPOSURE/IMMEDIATE), ABILITY LEVEL, AND DICTIONARY CONDITION
ANALYSIS OF VARIANCE OF SUPPLY-VOCABULARY SCORES (NO-EXP/IMMED)
BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION

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(* Sums and Partial Sums of Squares)
APPENDIX J

ANOVA OF SUPPLY-VOCABULARY SCORES BY EXPOSURE CONDITION (NO-EXPOSURE/DELAYED), ABILITY LEVEL, AND DICTIONARY CONDITION
**ANALYSIS OF VARIANCE OF SUPPLY-VOCABULARY SCORES (NO-EXP/DELAY) BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION**

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(* Sums and Partial Sums of Squares)
APPENDIX K

ANOVA OF SELECT- VOCABULARY SCORES BY EXPOSURE CONDITION (NO-EXPOSURE/IMMEDIATE), ABILITY LEVEL, AND DICTIONARY CONDITION
### ANALYSIS OF VARIANCE OF SELECT-VOCABULARY SCORES (NO-EXP/IMMED)
BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION

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**Total** 209 | 8037.0286

(* Sums and Partial Sums of Squares)
APPENDIX L

ANOVA OF SELECT-VOCABULARY SCORES BY EXPOSURE CONDITION (NO-EXPOSURE/DELAYED), ABILITY LEVEL, AND DICTIONARY CONDITION
ANALYSIS OF VARIANCE OF SELECT-VOCABULARY SCORES (NO-EXP/DELAY) 
BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION

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(* Sums and Partial Sums of Squares)
APPENDIX M

ANOVA OF SUPPLY-VOCABULARY SCORES (IMMEDIATE/DELAYED) BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION
## Analysis of Variance of Supply-Vocabulary Scores (Immed/Delay) by Exposure Condition, Ability Level, and Dictionary Condition

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(* Sums and Partial Sums of Squares)
APPENDIX N

ANOVA OF SELECT-VOCABULARY SCORES (IMMEDIATE/DELAYED) BY EXPOSURE CONDITION, ABILITY LEVEL, AND DICTIONARY CONDITION
## Analysis of Variance of Select-Vocabulary Scores (IMMED/DELAY) by Exposure Condition, Ability Level, and Dictionary Condition

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(* Sums and Partial Sums of Squares)
APPENDIX 0

ANOVA OF RECALL SCORES BY ABILITY LEVEL AND DICTIONARY CONDITION
### Analysis of Variance of Recall Scores by Ability Level and Dictionary Condition

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APPENDIX P

ANOVA OF RECALL SCORES BY ABILITY LEVEL, DICTIONARY CONDITION, AND TEXT-SET

200
### Analysis of Variance of Recall Scores by Ability Level, Dictionary Condition, and Text

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REFERENCES


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