

IMPLICIT AND EXPLICIT VOCABULARY ACQUISITION WITH A
COMPUTER-ASSISTED HYPERTEXT READING TASK:
COMPREHENSION AND RETENTION

by

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ABSTRACT

In a description of language, Ellis (1994) claims that “the bedrock of L2 is its vocabulary” (p. 11); while for Lewis (1993), language consists of “grammaticalized lexis,” not “lexicalized grammar,” and Nation (2001) adds that attention to vocabulary is unavoidable. This status of vocabulary determines its pervasiveness and implies the need for attention as claimed by Meara (1980). In second and foreign language teaching and learning, instruction is an important contributor in the development and consolidation of vocabulary knowledge while Computer-Assisted Language Learning has been described as facilitative in mediating instruction and improving learner independence (Chapelle 1998, 2001; Warschauer, 1998).

The present study investigates narrative comprehension, immediate and delayed vocabulary retention as a result of implicit and explicit teaching and learning of vocabulary (Hunt & Beglar, 2005) with a hypertext reading task. Many researchers support that enhanced vocabulary activities and reading for meaning affect vocabulary acquisition (Krashen, 1989, Zahar et al., 2001; Paribakht & Wesche, 1997; Lee & VanPatten, 2003). For others, the degree of involvement in the processing and the noticed properties of words determine the degree of retention (Groot, 2000; Smith, 2004).

Seventy-eight fourth-semester students of French as a foreign language from six classes at an American university participated in the study. They were randomly assigned to either the implicit or the explicit conditions, and received differential treatments. The subjects read the same enhanced electronic text with permanently highlighted target items in the explicit condition, and temporarily highlighted target items in the implicit condition. The target items were hyperlinked to the same textual, auditory, and graphic enhancements. The study also makes

an overview of the effect of the motivation type on the subjects' performance levels.

The statistical analyses reveal both strengths and weaknesses in the two modalities with regards to immediate and delayed retention; as one of the modalities favors immediate gain and the other longer-term retention. It is thus suggested that both modalities can be jointly implemented in a Computer-Assisted Teaching and Learning condition in order to achieve higher learning outcomes. The combination may favor the dual improvement in gain and retention in the learning process.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

In the strive to reach a proficient level in the target language, second and foreign language learners cannot omit, each at their own levels, to ask questions such as “what does X mean?” “What is the signification of Y?” “What would be a more appropriate term for Z?” “Is this the right word for X, Y, Z?”. This situation is created by the difficulty they face in gathering enough lexical knowledge in general or to make the pragmatic decision that fits the experience in real life under specific circumstances. It is difficult for many to find the appropriate term or phrase to use in a given communication situation or to appropriately understand what is being conveyed to them. Both second language learners who learn the everyday language of the learning environment and foreign language learners who learn a language that is not that of everyday communication in the learning environment aspire to be able to use their new language the way its native speakers do. The acquisition of this ability, however, is a lifelong process that educators and researchers try to shorten or to ease. Having as large a lexical knowledge as possible, being able to use it appropriately, conforming to usage norms, expressing what one exactly wants to convey or accurately decipher from a message with the meaning intended by the communicating source is a treasure most or every language learner aims at achieving.

Both second and foreign language learners have this difficult situation to overcome but that of the foreign language learners is made even more difficult by the fact that they do not have the potential advantage of the environmental setting that may be

available to the second language learners even though this well sought-after environment does not guarantee that language development will surely occur. The term “second language learner” describes the person who is learning a language in the very setting where the target language is the one of everyday communication. On the contrary, the term “foreign language learner” describes a learner whose target language is not the everyday language of the learning environment. Yet, both are also generally identified as second language learners. The dissociation between the learner and the community of speakers of the new language reduces the possibility of exposure to potential spontaneous input or natural opportunities for practice that might be available on occasions. As for second language learners --in the strict sense of the term—some of them might have the possibility of experiencing, even though without guarantee, some level of exposure and the opportunity of spontaneous input that may purposefully or randomly be accessible to them. This opportunity is related the fact that the target language can and may be used in their immediate surroundings even in uncontrolled circumstances. They receive both structured and unstructured input, either formally learning it or being exposed to it, in a variety of receivable forms. As for the foreign language learners, who primarily rely on the instructional environment, the input is traditionally limited to printed, auditory and graphic materials, which can approximate a live language environment. In today’s context, technology has become, and is increasingly facilitative, in bringing to the learner more continuously up-to-date input in a variety of modalities and even as real-time communication, thanks to hyperlinks and the World Wide Web. Computer Assisted Language Learning (CALL) facilitates the learner’s endeavor toward progress. This help

in learning is better provided and benefited from when it is guided by the theories of Second Language Acquisition and Teaching. Vocabulary acquisition, just as the learning of other aspects of language, can be done implicitly through reading comprehension (or listening) or explicitly through target-focused instruction, both aiming at long-term retention, a condition that relies mostly on attention.

1.2 Statement of the Problem

In foreign language learning, learners are faced with two fundamental problems in their efforts to learn the target language they have chosen or happen to be learning because of personal circumstances. In foreign language learning, it is difficult to obtain enough language input, both in and outside of learning institutions, as is the case for first and second language learners. This lacking creates the need to build a system that helps to increase the language potential of the learners in as consistently effective way as possible that will allow them to boost the acquisition and retention of functional language and beyond. For Groot (2000), there seems to be no viable alternative to intentional learning of a large number of words with the help of authentic L2 material. Groot referred to the fact that L1 vocabulary is mainly learned incidentally and incrementally over a longer period of time and that for L2, this time factor is not available at the same level while the L2 learner needs a large number of vocabulary words or phrases for immediate use. Thus, it is imperative that the acquisition process be accelerated. Once a method of learning vocabulary is chosen and used, the next problem is to find out if it leads to more comprehension and better acquisition and retention over time.

It also appears to be difficult for L2/FL learners to acquire the meaning of multiword units such as collocations and the relative meanings that they can obtain in given contexts of use. Compensation for this lack is difficult for foreign language learners, as they generally do not have the possibility of performing recurring interaction in the target language that can facilitate retention, thus the necessity for finding an alternative that will increase this possibility. Many studies have been done on implicit teaching, explicit teaching, comprehension, retention, and reading in hypertext environment, using different types of glosses. There are not many, however, that have compared implicit and explicit vocabulary acquisition with a hypertext reading task, to investigate comprehension and retention with fourth semester learners of French as a Foreign Language. Another difference is that the present study provides three types of annotations, namely a *translation* in the student's first language (*English* in the present case); an *audio representation* of the target unit in the target language (French in this case) and *graphics* including still images. According to Rott et al. (2002), multiple-choice glosses require "mental efforts" which in turn increase the likelihood of retention. Based on considerable empirical support, there is a widely held view that many learners acquire a lot of second language vocabulary incidentally while reading for meaning (Cho & Krashen 1994; Dupuy and Krashen, 1993; Rott, 1999, Zahar et al., 2001). Even though incremental, incidental acquisition is considered to be efficient as the readers do two things at once. Other researchers question how beginners would read enough to increase their vocabulary while they may not have the minimum knowledge necessary for reading and improving (Laufer 1997; Nation, 2001). This is known as the beginner's paradox.

1.3 The Notion of Vocabulary

In order to be complete, vocabulary should not be limited to individual words. It needs to include lexical items, grammatical features, whole phrases and discourse chunks also known as bundles as its units of identification. In the recent past, research in vocabulary has mostly concentrated on whether vocabulary is worth teaching at all. This situation led Meara (1980, 1983) to call for its active teaching. Ellis (1994) insists that “the bedrock of L2 is its vocabulary” (p. 11) while Lewis (1993, 1997) supports a lexical approach to language teaching, and claims that the dichotomy between grammar and vocabulary is invalid, as successful language goes beyond accuracy to include appropriateness and more. Most importantly, Lewis emphasizes that language consists of grammaticalized lexis—not lexicalized grammar, thereby calling for more attention on vocabulary learning. Not only has vocabulary recovered much of its importance, but also specific foci have been put on ways of presenting new language. Vocabulary is too important to ignore and constitutes the basis on which language lies. It is the concretization of language, the frame to which other language elements adhere. Additionally, vocabulary is not only a list of individual words of a language but also includes the grammar and grammatical forms of the language as well as the discourse created out of the combination of the individual words or phrases. As cited in Paribakht and Wesche (1997), Gairn and Redman (1986) provide a list of what needs to be taken into account when teaching vocabulary such as “boundaries between conceptual meaning (e.g. cup, mug, bowl); polysemy (e.g. head :of a person, of a pin, of an organization); homonymy (e.g. a file: used to put papers in or a tool); homophony (flour, flower);

synonymy (e.g. extend increase, expand); affective meaning (e.g. distinguishing between attitudinal and emotional factors, denotation and connotation, depending on the speaker's attitude or the situation or socio-cultural associations); style, register, dialect (levels of formality and geographical variations); translation (awareness of differences and similarities, false cognates); chunks of language (multi-words, idioms, strong and weak collocations and lexical phrases); grammar of vocabulary (rules for building words and deriving others from them (e.g. sleep, slept, sleeping; able, unable; disability))" (p. 181). In the present dissertation study, the notion of vocabulary includes individual words, multiword units, lexical and grammatical phrases and beyond, as opposed to the traditional vocabulary focusing solely on individual words. This is why the choices that can be made about vocabulary include aspects such as its presentation in context or by itself, implicitly or explicitly, as individual words or in multiword units (Moon, 1998), and in single or multiple exposures. Ultimately, in this study, the notion of vocabulary includes both individual vocabulary words and lexical units.

As part of this investigation, the problem raised is whether a single event of a vocabulary learning activity on the computer and with enhancements can be effective, especially when it is expected to be learned as a by-product of another activity as is the case for reading comprehension activity or explicitly as a word learning task from a text in the present study. Other choices related to the teaching and learning of vocabulary involve determining if vocabulary should be learned and taught receptively or productively, actively and passively through listening and/or reading, relating of new information to old, in a teacher-controlled environment, or focusing on strategy training and strategy

use. The issue of strategy training, however, is beyond the scope of this dissertation. The list of techniques involved in this study are limited to teaching vocabulary through intensive reading, with written, auditory and graphic sources of enhancement in the input; learner-controlled activities; in-depth processing of language; and comprehension and retention (short-term or long-term) as an end goal.

1. 4 Overview of the Study

The present dissertation study investigates the implicit and explicit modalities of teaching and learning of vocabulary with an electronic text presented on the computer. Seventy-eight students of French at the intermediate university level participated in the study. The subjects were randomly assigned to two conditions: an implicit group and an explicit group and were asked to fill out a background questionnaire before the formal task. The groups received slightly different treatments on the computer and read a text containing sixty-five target words highlighted and hyperlinked to additional information in a variety of modalities: textual, graphic, and auditory. The implicit group was instructed to read the text for comprehension and was informed that there will be an additional task to do after the reading. They were also informed that the highlighted words were hyperlinked to additional help. If the word was difficult, they could click on it to obtain help I understanding it, but they did not have to click on the highlighted words if they did not need to do so. Each time they clicked on a word, the highlighting disappeared while the hypertext remained in place. The explicit group was instructed to read the text and learn the highlighted vocabulary words. They were also informed that

there were going to do an additional activity when they finished the reading. It was also explained to them that they needed to click at least once on each of the highlighted words before they could proceed to the next page. As they clicked on the target words, the color of the highlighting changed into another type of blue without fading away. All the highlighted words remained so throughout the activity. After the reading, the subjects in both groups took a sixty-five item multiple-choice vocabulary test followed by a free recall protocol for which they were instructed to write down everything they remembered from the text. Next, they filled out a posttest survey. Three and a half weeks later, both groups took the same sixty-five item multiple-choice vocabulary test followed by an exit questionnaire. The study specifically focuses on the differential effects of the two modalities on short-term and long-term retention, looking into the extent to which one modality may lead to longer retention than the other, and improve comprehension of a narrative under the same conditions. The study also marginally investigated the effect of motivation on learner performance in comprehension, immediate retention and delayed retention. The following section explains the purpose of this study.

1. 5 Purpose of the Study

The main purpose of this study is to explore ways of teaching and learning foreign language vocabulary that may lead to better comprehension and longer retention, while providing more learner independence. The results could contribute to the improvement of instruction in the teaching and learning of foreign languages in general and the teaching and learning of French as a foreign language in particular. The study investigates two

ways of teaching and learning foreign language vocabulary, the implicit and explicit modes, utilizing a computerized reading text in which the target words and phrases are highlighted and hyperlinked to textual, graphic, and auditory enhancements. The study focuses on the extent to which the subjects in the two conditions, while having control over the learning environment in their own ways, will achieve in the same way or very differently in terms of comprehension, and most importantly in terms of retention of French vocabulary, first by the end of the activity and then three and a half weeks later. In short, the study aims at uncovering how the acquisition of vocabulary may be affected, comparing when subjects are explicitly instructed to learn and memorize the highlighted vocabulary items, to when they are instructed to read to comprehend the narrative only.

The second purpose of the present study is to investigate the relationship between the type of learner and the learning outcomes in the implicit and explicit modes of learning vocabulary with the help of a hypertext reading task. The subjects were randomly and individually assigned to one of the two conditions: the implicit or the explicit. The study specifically asks questions on the effects of implicit and explicit teaching of vocabulary with a hypertext reading task on comprehension, immediate retention, delayed or long-term retention, and the correlation between the type of learner and vocabulary learning outcome, which have important implications for language learning.

1. 5. 1. Importance of the study.

In foreign language learning, it is difficult to obtain enough language input both in and out of learning institutions. This reduced level of input creates the need to build a system that helps to increase the language potential of the learners in as consistently effective and regular a way as possible that will allow them to boost the acquisition and retention of functional language and beyond. This study is concerned with the provision of authentic language input and an attempt to work toward efficiency and learner independence in the learning environment.

Many studies have been done on implicit teaching, explicit teaching, comprehension, retention, reading in the hypertext environment, and using different types of glosses, but none have compared implicit and explicit vocabulary acquisition with a hypertext reading task to investigate comprehension and retention with fourth semester learners of French as a foreign language. This present study fills the gap and provides three types of annotations, namely a *translation* in the student's first language (*English* in the present case); *graphics* including still images, and an *audio representation* of the target item.

1. 6 Definition of Important Terms

1. 6. 1 Implicit learning.

Learning is implicit when its real object is not included in the instructions made available to the learner. In this condition, the learner perceives the need to know the implicit target information because it appears to be preliminary to understanding or internalizing the

overtly displayed objective of the activity. In the course of the activity, this implicit information can be apperceived and internalized. The incidental acquisition of learning is constrained by the necessity to read for meaning while acquiring vocabulary as a by-product of the reading activity.

1. 6. 2 Explicit learning.

The explicit learning condition is the situation in which the learners are consciously aware of the target features under investigation and are overtly instructed on what is expected of them within the activity. For Schmitt (1997), describes as explicit learning, the condition in which the learners deliberately attempt to memorize lexical information by rehearsing or using mnemonic techniques.

1. 6. 3 Immediate retention.

Immediate retention refers to the level of retention of the newly comprehended piece of information as measured by a test right after the experimental treatment. It is used to assess the level of retention of the target items as determined by the immediate posttest that follows the learning activity carried out by the learners. It can also be described as medium-term retention, as it goes beyond the working memory phase.

1. 6. 4 Delayed retention.

Delayed retention refers to the medium-term retention of the information learned. It is the level of retention of the target piece of information newly acquired through the

experimental treatment, as measured by a test on that novel information, as a result of a test taken at the end of a given period of time after the experimental treatment. In this particular case, the delayed test was given to the subjects three and a half weeks later. Delayed retention can thus be described as long-term retention of the items as it is assessed beyond the medium-term retention discussed above.

1. 6. 5 Hypertext.

Hypertext can be labeled “hypertext” or “hypermedia” depending on the kind of information it presents in hyperlinks. It allows the reader, with the aid of an interactive browser program, to move easily from one document to another. It is a non-linear method for reading documents on the computer that can display text and multimedia, such as graphics, sounds, and video (hypermedia). It presents information in node and link network that form navigable paths that can be toured, revisited, and documented. It offers the learner the possibility of accessing information in any orders he or she prefers, with the possibility of reviewing as many times as possible or avoiding any irrelevant paths.

1. 7 Research Questions

This study investigated two different ways of presenting vocabulary items to readers in a computerized environment with added help devices in an attempt to find out which of the two modes of teaching vocabulary through reading would lead to better comprehension and longer retention of the target items. The study specifically addressed the following three research questions:

- 1) What is the effect of implicit and explicit teaching of vocabulary on comprehension?
 - a) What is the effect of implicit teaching of vocabulary on text comprehension?
 - b) What is the effect of explicit teaching of vocabulary on text comprehension?

- 2) What is the effect of implicit and explicit teaching on retention?
 - a) What is the effect of implicit teaching on immediate retention?
 - b) What is the effect of explicit teaching on immediate retention?
 - c) What is the effect on implicit teaching on delayed retention?
 - d) What is the effect of explicit teaching on delayed retention?

- 3) What is the effect of learner motivation on text comprehension and vocabulary retention in an implicit modality and an explicit modality of vocabulary teaching?

The research questions and the hypotheses that follow are discussed in details in chapter three.

1. 8 Hypotheses

In relation to the implications of comprehension and retention for vocabulary, the following hypotheses are formulated:

- 1) The Implicit Group will retain vocabulary moderately but its level of retention will not fade as rapidly as that of the Explicit Group.
- 2) The Explicit Group will understand and retain much of the vocabulary at once but this retention will fade more rapidly over time than for the Implicit Group.

3) The learners who have instrumental motivation for learning the foreign language will retain longer than those who learn the foreign language primarily as a requirement.

1. 9 Structure of the Dissertation

The present dissertation is divided into five chapters. The first chapter introduces the study and states the problem that motivated the present research study. The chapter introduces the notion of vocabulary I comparison with structure and discourse, and its relevance for study. Next, the chapter presents an overview of the study, the purpose of the study and its importance before defining important terms used in it. After that, it presents the research questions on which the study focused, and the hypotheses formulated for the study. The chapter finally provides a description of the structure of the dissertation. The chapter concludes with the purpose of the study, the statement of its importance, and an outline of the dissertation.

Chapter 2 presents information on the theoretical bases of the study, including theories of vocabulary learning and acquisition, Deep Processing Theory, and Involvement Load Theory. Next, it discusses the relationship between technology, teaching, and learning, hypertext theory, and Cognitive Theory of Multimedia learning. The chapter then discusses issues in vocabulary learning through reading, vocabulary instruction (both direct and indirect) before discussing implicit and explicit learning of languages in general and vocabulary in particular. Chapter two also discusses the bidirectional framework for vocabulary learning introduced by Hunt and Beglar (2005), grammar-based learning as well as recognition and production in vocabulary learning.

After that, the chapter presents the review of relevant literature on the theories introduced earlier, both descriptive and empirical research, covering the role of attention and the role of some dimensions of Computer Assisted Language Learning in learning vocabulary, the relationship between reading comprehension and vocabulary acquisition and retention. Next, it presents the research questions on which the study focused, the hypotheses, and finally describes the structure of the dissertation were presented. It then presents enhancement theories, implicit and explicit learning, and the notions of comprehension and retention.

Chapter 3 presents the methodology employed in the present study. It includes the details of the research questions, materials development, participants and site, research design, data collection (both instruments and procedures) and data analysis.

Chapter 4 reports the results of the analyses conducted. Each of the research questions was answered discussed individually and supported with resulting tables.

Chapter 5 concludes the study with a discussion of the findings, pedagogical implications, notes on the limitations of the study, and recommendations for future research on vocabulary acquisition and CALL.

CHAPTER TWO: REVIEW OF THE LITERATURE

2. 1 Introduction

This chapter reviews both empirical and descriptive studies related to the present dissertation. It is selective and limited to studies that have direct incidence on the issue. Due to the size of previous studies, those included here cannot be exhaustive. However, each of the studies touches on a particular dimension and brings a unique contribution in the clarification of the issues under investigation. The chapter sheds light on the relation between reading and vocabulary acquisition before introducing the relationship between vocabulary and instruction. Next, the chapter reviews the role of attention by discussing implicit and explicit ways of acquiring vocabulary and comprehending narrative, all with the use of hypertext glosses. The chapter then reviews the relationship between deep processing and retention before closing with the role of motivation in learning vocabulary.

2. 2 Theoretical Background of the Study

This study focuses on theories associated with comprehension, the processing of information through means that favor retention, and their impact on implicit and explicit modes of vocabulary acquisition. Relevant to the present study and reviewed here will be Vocabulary Acquisition Theory (Coady et al., 1985, 1993; Nation, 1990; Lewis, 1997), Dual Coding Theory (Paivio, 1971; 1986), Levels of Processing Theory (Craik and Lockhart, 1972), Involvement Load Theory (Laufer and Hulstijn, 2001) and the Cognitive Theory of Multimedia (Wittrock, 1990; Mayer, 1997; 2001). What follows is a

comparison of the implicit and explicit modalities of teaching and learning vocabulary as done on the computer, and their impact on comprehension and retention, assessed at different points in time.

Coady et al.'s (1985) theory of vocabulary acquisition advocates special focus on the category of words whose forms and often meanings are unknown to the learner and urges the use of practical learning action as a solution to the limitations that constrain the second language learner's vocabulary knowledge. In this theory, active teaching and learning of vocabulary is essential to second language development. Coady's (1993) Theory of Vocabulary Knowledge and the ability to comprehend text are inextricably linked to breadth and depth of a student's vocabulary as a key predictor of his or her ability to understand a wide range of texts. According to Coady's theory, vocabulary learners need good vocabulary knowledge in order to be able to successfully derive word meaning as a limited knowledge can lead to faulty guessing. This is what Nation (1990) describes as the paradox of the beginner.

For Nation (1990), vocabulary choice should be based on good understanding of the principles behind it, the theoretical and experimental justification, and the way of dealing with it. Nation also believes that there is a place for both direct and indirect vocabulary learning and that contact with language in use should be given more time than decontextualized activities. Thus, vocabulary teaching and learning need to be principled and based on empirical findings in teaching, learning, and production. Nation (1990) also supports the view that foreign and second language learners at lower levels need to develop vocabulary for different purposes, and those at higher levels need to improve

theirs in order to ascend toward the native speakers' level of competence and performance. As a means of enhancing vocabulary instruction, there has been a diversification in the forms and use of technology in teaching and learning vocabulary through the use of software and hypertext, as well as the World Wide Web among other aspects. This use of technology provides the opportunity to introduce the new language in a diverse form that can support the variety of processes as well as allow the possibility of matching diverse learner strategies. This use of multiple modalities is supported by Paivio's (1971, 1986) Dual Coding Theory and Myer's (1997, 2001) Cognitive Theory of Multimedia.

2. 2. 1 Dual Coding Theory.

Paivio's (1971; 1986) Dual Coding Theory assumes that two separate symbolic systems function in memory and cognition, one specialized for the representation of nonverbal graphic information such as objects and events, and the other dealing with verbal linguistic information. The two systems, while interconnected, can also function independently. Dual Coding Theory states that working memory can process visual and auditory information simultaneously with no adverse effect on cognitive load. This simultaneity creates support among the multiform processes that reinforce retention of the processed information. Simpson (1995) added that the verbal and visual systems can be activated independently, but there are interconnections between them that allow dual coding of information. This interconnectedness permits cueing from one system to the other, which in turn facilitates the interpretation of our environment. These two ways of

coding information appear to be complementary to each other or even to duplicate one another and consequently give the learner double the processing opportunity, which in turn favors retention of the information that is treated, providing a strong theoretical basis for the use of multi-modal presentation of new vocabulary. Actually, this view supports the fact that learners comprehend and acquire language better when they are presented with input enhanced in a variety of modes. One possibility that explains this assumption is that nonverbal codes have additive effects on recall as they are functionally independent. These additive effects can also set up a dual verbal-nonverbal memory trace by imaging to concrete words and pictures, and this dual presentation can be done through enhancement of text with additional verbal and non-verbal information. In order to help foreign and second language learners acquire more vocabulary and more skills in the appropriate use of the target language, software and online language materials have increasingly supplemented vocabulary instruction in Computer-Assisted Language Learning.

2. 2. 2 Deep Processing Theory.

According to Craik and Lockhart's (1972; 1975) Levels of Processing Framework, information is simultaneously processed at multiple levels depending on its characteristics; and the deeper the processing, the more that information will be remembered. The degree of retention is also linked to the meaningfulness of a situation, which in turn triggers a deeper Level of Processing. Craik and Lockhart (1975) state that non-semantic processing is linked to a relatively superficial level of analysis and a

relatively short-lived memory trace, but semantic processing is associated with a more elaborate and deeper analysis and thus longer retention. According to a later version of the framework by Craik (2002), shallow processing also could lead to very good long-term memory.

In addition to the Levels of Processing Framework, Craik and Tulving's (1975) Elaboration Theory is a highly inclusive framework according to which new information may be incorporated or assimilated into old information through an elaboration that is processed through the use of advance organizers, a progressive differentiation, and integrative reconciliation that prescribes the integration of major constructs. Craik and Tulving (1975) demonstrate that subjects who focus on meaning (even without intention to remember) process stimuli more deeply and retain such stimuli longer than do subjects who pay a great deal of attention to structure and who purposely attempt to remember. Thus, focusing on meaning and manipulating information at these levels may lead to retention even though the subject does not have the intention to do so, and deep processing of information could lead to longer retention than superficial processing.

2. 2. 3 Involvement Load Theories.

As for Laufer and Hulstijn's (2001) Involvement Load Theory, retention of unfamiliar words is conditional, in general, upon the degree of involvement in processing, which depends on the levels of "need," "search," and "evaluation," imposed by the reading tasks at hand (p. 543). Need is a motivational aspect and is about the felt necessity to comply with the task. Search involves making attempts to determine the

meaning of an unknown word, and the notion of evaluation involves making a decision about the semantic and formal appropriateness of the word and its context. Retention is thus favored by dual coding, depth of processing, and elaboration. This situation led Hulstijn (2003) to hypothesize that retention of unfamiliar or unknown words and phrases is conditional upon the degree of involvement in the processing of the information. Therefore, though retention is attached to learning intention and condition, it depends more on the environmental conditions and cognitive processes of the learner than the intention. How do instructions affect vocabulary acquisition?

2. 3 Technology, Teaching, and Learning

Computer Assisted Language Learning (CALL) is the use of computers and other technological devices in aiding in the teaching and learning of languages. In its applications, the computer is a tool for instruction and production (Prescot, 1995) that helps in teaching and learning, providing a better combination of input and instruction and ways of managing the interaction that makes the learner less dependent on supervision, and provides as much information as possible through hyperconnection. According to Levy's (1997) theory, the use a computer is not in itself the objective of instruction but primarily as a tool for facilitating learning while being open to innovation. It is an account of the computer as an effective means of integrating authentic target language materials of all modalities into the curriculum. CALL is the most up-to-date and established acronym in describing the use of computers in aiding teaching and learning. CALL is now a major part of teaching and learning, but Bax (2003) cautions that it needs

to be invisible so that what it is helping to convey clearly remains salient, not the computer technology. CALL must serve, and not be served. CALL has gone a long way from its structural beginnings (1970s-1980s), then to communicative mutation (1980s-1990s) and into today's integrative level (21st century) (Warschauer and Healey, 2000). Integrative CALL, using Warschauer and Healey's (2000) term, brings authentic discourse to the learning environment, uses communicative language teaching as methodology, and aims at accuracy and fluency altogether. It integrates multimedia, Internet, and content-based language teaching with a socio-cognitive view developed into social interaction. Today's CALL programs work as normal tools for learning are integrated into the syllabi and adapted to student needs. CALL facilitates the presentation and treatment of input and output in the many different forms they can take. Along the development path, CALL has used software of various kinds and hypertext to interconnect nodes of learning materials, bringing to the user additional information that is most crucial to make the most of the information. But what is the role of hypertext in teaching and learning vocabulary?

2. 3. 1 Hypertext theory.

“Hypertext Approach,” so named by Goodfellow and Laurillard (1994), allows generating links between vocabulary items and the multiplicity of senses, contexts and discourses in which they are employed. The use of hypertext in reading can be understood in terms of Cognitive Load Theory (Sweller, 1988) according to which the reduction of cognitive load allows the learner to allocate much of his or her cognitive

ability to the target task without being side-tracked by extraneous efforts. In a hypertext document, information is stored as a network of nodes connected by hyperlinks.

Hypertexts provide the opportunity to jump from one part to another in a document. They facilitate the retrieval of the information made available on an item in any order preferred by the reader, with the possibility of revisiting as many times as needed and in any forms offered. A hypermedia system is an extension of the hypertext principle that integrates elements of multimedia, allowing selection with a mouse click of animation, video, and sound from within the document.

In the learning of a second language with hypermedia, the multimedia principle, and the individual difference principle are of great importance. For the multimedia principle, it is the combination of both visual and verbal presentations of information that has most strongly and consistently supported listening and reading comprehension and vocabulary acquisition. The multimedia principle claims that students acquire language better from input enhanced by text and pictures than by text alone. The paired availability of text and pictures allows learners to construct verbal and visual mental models of the input and build connections between them.

According to the individual difference principle, students acquire language better when they have the choice of visual versus verbal annotations rather than visual or verbal annotations alone. As the most important modalities are the visual and the verbal, it is an advantage to have both presented together. These combined modalities allow learners to choose those modes that correspond with their learning styles. Hypertext plays a role exponentially similar to what footnotes, parentheses, cross-references and references do

in a traditional printed text. It allows the user to have several lines of inquiry open at a particular point within a document, and especially with a possibility of back-tracking the reference. The hyperlinked information can be accessed with high speed, and this process alleviates the load of looking for all that information from other documents including text, graphics, and sounds before coming back to the reading material as is done with paper texts. Hypertext allows the user to access information in the order preferred as well as to retrieve information in any mode presented. It is an exceptionally beneficial and convenient means of collecting information with less physical effort. Second and foreign language teachers, just as their other colleagues, know how very well flexible CALL is and can accommodate all the possible multimedia that can be treated with it. It can support printed and audio materials, graphic materials such as pictures and video. CALL also allows the learner to produce language in response to given prompts in any form supported by the computer. The combination of these modalities is generically described as multimedia, based on the theory discussed in the next section.

2. 3. 2 Cognitive Theory of Multimedia.

According to Cognitive Theory of Multimedia Learning (Mayer, 2001), the human information processing system includes dual channels for visual/pictorial and auditory/verbal processing. Each channel has limited capacity for processing, and active learning entails carrying out a coordinated set of cognitive processes during learning. The Cognitive Theory of Multimedia is itself based on Paivo's (1971; 1986) Dual Coding

Theory cited in a previous section. It is a theoretical basis for the use of multimodal presentation of new information.

Cognitive Load Theory (Sweller, 1988) also has implications in multimedia presentation of information. It maintains that effective instructional material facilitates learning by directing cognitive resources towards activities that are relevant to schema acquisition, thus eliminating extraneous ones and that learning is constrained by the capacity and the means available to the individual learner. Thus multimodality needs to be controlled for cognitive overload that would make the process more difficult instead of simplifying it. This is the reason why the present study focuses on only three modes of enhancement to the target words. If extraneous efforts happen to be added to the necessary processing effort, it will represent a dispersion of efforts that would normally serve to comprehend or retain the element under attention. In multimedia learning, generative theory assumes that the combined use of modes of information delivery such as text, graphics, audio, video, and animation affects the level at which learners employ cognitive processes to acquire knowledge.

2. 4 Vocabulary Learning Through Reading

Reading is one of the most significant sources of second language (L2) lexical development (Krashen, 1989) and improvement. Vocabulary acquisition researchers have empirically proven that learners acquire a lot of L2 vocabulary incidentally while reading for meaning (Dupuy and Krashen, 1993; Zahar et al., 2001) and most people enlarge their vocabularies through reading by focusing on the meaning of words and texts, instead of

the conscious, intentional memorization of lists of word forms and their meanings. Other researchers such as Schmidt (1995) and Hunt and Beglar (2005) insist that more direct, goal-oriented, and explicit instruction is more effective and beneficial than implicit learning. Reading is strongly related to vocabulary knowledge (Laufer, 1997) as well as to principles of Schema Theory that connect top-down knowledge structures and bottom-up word-forms and supports that pre-existing mental representations of ideas by readers act as advance organizers during comprehension and help the reader recognize, organize and interpret the ideas available in the reading text accordingly. It is a function of the use of multiple sources and background knowledge. When word-forms are automatically and instantaneously recognized, they constitute a portal to schemata and the lexicon that favors the association of new knowledge with the schemata already known. Excluding text variables and exposure frequency, intermediate learners acquire and retain unknown vocabulary as a result of reading (Laufer, 1997). With reading, comes comprehension, but in order to be comprehended, information needs to be provided in various forms of text, literary or other, that is accessible to the subject, and can also be reinforced with graphics. In the case of learning vocabulary, input can be presented through reading and listening.

The greatest benefits that can be obtained from reading literature are the unlimited knowledge and pleasure it can provide as well as the connection it creates between reading and the other skills, namely writing, speaking, listening, grammar, and lexis. Reading has enormous influence on linguistic and cognitive development and reading materials can be selected for groups of students from simplified to essays, short stories,

and novels, based on their reading level, interests, and academic needs. In order to aid vocabulary acquisition, input is provided in visual (pictorial) and verbal forms (written, spoken) and the interaction between reading and vocabulary learning is discussed in many studies (Dupuy and Krashen, 1993; Laufer, 1997; Qian, 1999; Hunt and Beglar, 2005)

In the field of ESL, Zahar et al. (2001) investigated the acquisition of vocabulary through reading in relation to the effect of frequency and richness of context. The participants were 144 male ESL students from grade 7 who had already completed three semesters of class in a school where they were instructed in French before the study. The subjects' initial vocabulary knowledge was tested using Nation's (1990) Vocabulary Levels Test. The students were given a pretest 13 days before the treatment to determine the correlation between the placement they received and their performance on the test. There were 30 target words. The treatment was an audio text to which they listened while simultaneously following the written version to ensure one complete input of the story. This procedure was expected to trigger actions such as word learning, note-taking, later look-up of the unknown words. The subjects were not allowed to ask clarification questions but were told to try to understand the story as much as they could. The study was a pretest-posttest experimental model. The procedure included testing of the participants' vocabulary size in order to guide reading-text selection choice of words potentially unknown to the participants. A pretest was used to evaluate prior knowledge of these words. The reading conditions were controlled when necessary, and the same items of the pre-test were used as posttest. The amount of vocabulary acquisition gained from

reading was assessed. A post hoc test was carried out in order to identify the conditions under which the acquisition occurred, with respect to the number of occurrences, and the type of contextual support of the words acquired in a Communicative language teaching environment.

The results show that the average number of words learned across groups was 2.16 from the 30 words tested with extremes of 1.48 and 3.03. In general, across groups, learned words tended to be the most frequent with on average, the most learned appearing seven times in the text with a $SD = 4.6$, and the least ones 2.75 times ($SD = .96$). The researcher suggested that acquisition through reading is supplemented by either direct vocabulary instruction as also supported by Nation and Waring (1997) or instructionally enhanced reading as favored by Hulstijn et al. (1996) when a better result is expected.

2. 5 Vocabulary Instruction

In consideration to the fact that vocabulary not only constitutes the most concrete part of language but also materializes communication (the ultimate goal of language learning), Lewis (1997) states that language is grammaticalized lexis, not lexicalized grammar. For this reason, the teaching and learning of vocabulary is essential in language learning and teaching in general and particularly in second and foreign languages. Lewis suggests that collocation is used as an organizing principle, and that the Observe-Hypothesize-Experiment cycle replaces the Present-Practice-Produce paradigm in teaching vocabulary. While suggestions are either in favor of an inductive and implicit

type (e.g. Lewis, 1997; McKay, 1980), an explicit and deductive one (Sansome, 2000), or a combination of both (Hunt and Beglar, 2005), frequency of occurrence, saliency, and a word's function in its context of use are very useful and saliency can be achieved for example through instructional focus to facilitate the learning of words.

2. 5.1 Direct or indirect instruction.

The debate on second language (L2) vocabulary development, teaching, and learning has been to a large part around direct instruction, incidental learning and exposure to print for the acquisition of vocabulary items. The use of implicit or explicit instruction, contextualized and decontextualized information, passive or active, conscious awareness in learning, active and deep processing of vocabulary, memorization or schematic knowledge, extensive and intensive teaching or learning, the relation between quantity of reading and subsequent vocabulary acquisition; the contribution of the local and/or global environment; given or inferred meaning; the role of advance organizers, the use of visual and other sensory modes, dictionary definitions and contextual understanding; and calling attention to unknown words in a comprehensive reading instructional framework can be added to these. The major questions asked by Nation and Meara in Schmidt (2002) about “what vocabulary should be learned?” and “how should it be learned?” can be answered with two major considerations taken into account: the needs of the learners and the urgency of the usefulness of the vocabulary items. Suggestions are made for deliberately learning vocabulary from meaning-focused input and output; developing fluency with vocabulary across the four skills (listening,

speaking, reading and writing) and strategy development, such as inferring the meaning of words from context, learning from word cards, using word parts, dictionaries and assessing one's own vocabulary knowledge, and using computers. In the meaning-focused learning environment, three major conditions need to be met: work with a reasonable rate of unknown words, have access to a large quantity of input, and maintain deliberate attention to the unknown words. Other conditions that are important include making the target item recurrent, stimulating the learner's awareness and consciousness on the unknown words through glossing, and highlighting of new words as well as on dictionary use. Word learning can be done by producing both oral and written text using learning aids such as item enhancement, the use of technology, and collaborative work. Over the decades, vocabulary instruction has evolved in a number of directions and ways, from traditional to more innovative and eclectic modes, and more and more aided with technology as apparent in the studies that follow.

Hunt and Beglar (2005) affirm that explicit, direct vocabulary instruction seems to be more effective for vocabulary development than those modes that rely exclusively on indirect means and that "connecting word form and meaning is best learned explicitly whereas the phonetic and phonological features and articulation of new words is best learned implicitly." In addition, varying the contexts, scrupulous planning and direct instruction, with each word being given salient instructional focus can provide automaticity. Many encounters with a word and the multiplicity of enhancements lead to a degree of retention. However, Hulstijn et al. (1996) maintain that multiple exposures

often fail to have the expected impact on acquisition and alternative means may thus be sought to help retention.

2.5.2 Implicit or explicit vocabulary instruction and learning?

Research has shown that vocabulary is neither the exclusive domain of implicit nor that of explicit learning but it is rather associated with both and the two modalities interact with and influence each other. According to Ellis (1994) there are “specialized modules, the input and output lexicons, which acquire the forms and regularities of the surface form of language by implicit learning principles,” and these modules become automatized by instances of frequency and memory. For Hulstijn (2001), even in the case of learning an L2, “a large number of words cannot have been learnt solely by means of explicit vocabulary instruction; rather, most words are learned in an incremental way through repeated encounters during extensive reading” (p271). For this reason, it is recommended that foreign language learners take the advantage of the incidental nature of vocabulary acquisition so that they can increase or improve their vocabulary knowledge.

2.5.2.1 Implicit learning of vocabulary.

In support of the implicit learning of language, Wode (1999) states that in general, “a language is learned not for its own sake but as a by-product of a given individual’s socialization process. That is, children acquire the language(s) of their environment as part of learning to cognize the world around them. Moreover, the socialization process is

never completed because people need to adapt continuously to changes in their environment, even as adults. Such adaptation includes the acquisition and development of whatever language(s) the individual may be challenged to learn, regardless of whether or not the language is an L1, L2, or reacquisition, or whether a language is acquired in a natural context or in a classroom in which the language is the instructional medium. In this sense the acquisition of a language is incidental with respect to the situation in which it occurs because the language is not the primary object of the activity or process.” (p. 244).

According to Hulstijn (2003), “much of the burden of intentional learning can be taken off the shoulders of the language learner by processes of incidental learning, involving the picking up of words and structures, simply by engaging in a variety of communicative activities” (p. 358) in particular reading and listening activities during which the learner’s attention is focused on meaning rather than on the form of the language itself. Hulstijn defines implicit learning a passive process, where people are exposed to information, and acquire knowledge of that information simply through that exposure. Some psychologists suggest that much of the information learned during the normal course of life is learned implicitly, in the absence of conscious awareness. It refers to activities that people can do but cannot explain how.

In fact, implicit learning is not passive at all but is so named because the real focus of the activity is not made explicit to the learner, and the target appears as an unavoidable way forward to the resolution of the overtly expressed objective of the activity. The learner must find a way of internalizing it as a means to achieve the goal of

the activity. It is the outcome of a shift of attention to linguistic code features triggered by perceived problems with comprehension or production as Long and Robinson (1998) puts it and around focal *noticing* in Schmidt's (1990) term. In this process, learners acquire vocabulary incidentally, as by-product of their goal of comprehending the input (Hulstijn, 1992; Hulstijn et al. 1996; Yoshii and Flaitz 2002). The researcher has chosen the term "implicit" over "incidental" because what he labels as implicit is a planned situation but that is not overtly externalized, and appears as an unavoidable intermediate stage in achieving the declared goal of the activity.

Starting from the generally accepted principle in foreign and second language instruction that extensive L2 reading is good for vocabulary acquisition and by taking into consideration the huge number of words known to first and second language speakers upon university entry, Hulstijn et al. (1996) concluded that such huge quantities cannot have been learned solely by intentional word-learning activities. They stated that, in fact, readers sometimes fail to notice unfamiliar words or mistakenly think that they know the words or purposely do so; at occasions the context does not facilitate the connection between the form and the meaning of words, and at moments the learners make erroneous inferences. Sometimes they just do not look up all the unknown words, or simply a single encounter with a word does not guarantee its acquisition. As a possible solution among the factors that can possibly promote incidental vocabulary learning, Hulstijn et al. (1996) list deep elaboration on the meaning that leads to retention (Hulstijn, 1992; Mondria and Wit-de-Boer, 1991; Watanabe, 1992); readers sometimes give more attention to some words than others; learners who have high verbal ability or

large vocabularies “pick up” more words than others; the use of dictionary and provision of marginal glosses positively affect incidental vocabulary; and the choice of language used in glosses as well as frequency of appearance of a word affect incidental learning. Hulstijn et al. (1996) have come to the conclusion that incidental vocabulary learning during reading does indeed take place but only incrementally and in small quantities. Given the undeniable usefulness of L2 reading, they investigated which of provision of marginal glosses, use of dictionary, and reappearance or reoccurrence of new words in a text favorably affects incidental vocabulary learning? Hulstijn et al. (1996) investigated vocabulary retention in a classroom environment under three conditions: Reading with Marginal Glosses (MG), reading with Access to a Dictionary (DG), and reading without any of the two conditions or Control Group (CG). They hypothesized that retention of the meaning of the unfamiliar target words will be higher in the marginal gloss condition than in the dictionary condition. In terms of retention, the marginal gloss condition will profit better, the dictionary condition will perform moderately, and the control condition will profit the least. 78 Dutch first year university students of French as a foreign language from three universities participated in the study. They were considered to be advanced students of French, and were randomly assigned to the Marginal Gloss (MG), Dictionary (DG), or Control Groups (CG). The subjects read a 1306-word narrative text of which 16 words estimated to be unfamiliar to the students were chosen as targets. The students then answered comprehension questions in the absence of the text. The text was controlled for relevance and comprehensibility. The target words were controlled for the level of difficulty, and part of them for frequency of appearance, and saliency. The

Marginal Gloss group had explanations at the margin of the text, the Dictionary Group had a paper dictionary to consult, and the Control group had none of these apart from the text. Three posttests were given to the subjects. The first one was a combined word recognition and recall in which the MG group had to say if the word appeared in the text or not, and give its meaning. The Dictionary Group had to say if they looked up the word or not and then provide its meaning, either in Dutch or in French. The second test aimed to measure prior knowledge of the target words. In the third and final posttest, the subjects were asked to provide the meanings of the target words as they were presented in their local context in the text.

The results showed that the words that appeared three times in the text were equally recognized in all three groups. The MG group always performed higher for the f1 and f3 words while the D group and C group did not differ. Frequency had a significant effect [$F(1, 75) = 34.24, p < .001$] as did Group [$F(2, 75) = 15.14, p < .0001$]. The retention rate for the Dictionary Group was 59%. When the Dictionary group used their dictionaries, their retention rates were even higher than those of the MG group. It was demonstrated that both the provision of marginal glosses and the reoccurrence of words in the text facilitated vocabulary learning with respect to four words. Frequency of occurrence of the target words in the text had a significant impact on the retention of exact word meanings. Hulstijn et al. (1996) suggest that incidental learning does not need to be replaced with intentional learning, but it can be followed up with intentional learning. The authors reinforce this suggestion by quoting Haastrup (1989) who says that “learners will always find out the meaning of words that are important to them” (p. 43)

In his 2003 quasi-experimental study, Herman investigated the extent to which reading literature, as compared to rote memorization of paired-associates, facilitates lexical acquisition and retention in adult nonnative speakers of English. A total of 34 university students comprised in two intact classes participated in the study. The researcher hypothesized that participants who read literature, focusing on meaning will acquire more vocabulary words than subjects who intentionally do so via memorization, and those who acquire vocabulary incidentally through reading literature will exhibit higher retention rates than those who learn it through rote memorization. Two intact classes (N=17) were selected to function as the experimental group and two others (N=17) were selected to function as the control group. The test material was a 35-item exercise with 20 multiple-choice items and 15 fill-in-the-blank items. The target words were selected from the text of *Animal Farm* that was used for the treatment.

The subjects in the experimental group read a literary text (*Animal Farm* by George Orwell), and those in the control group were presented with a 50-item word list as paired-associates to learn and memorize. Apart from the pretests taken by both groups, two posttests were taken by both: one immediately after the treatment, the other 23 days later for the narrative group, and 21 days later, for the paired-associates group. The results reveal that contrary to hypothesis 1, the control group gained more vocabulary than the experimental group between posttest 1 and posttest 2 ($\chi^2 = 7.52, df = 1, p \leq .05$). In support of hypothesis 2, the experimental group exhibited superior performance on the test for lexical retention. The control group experienced a decline of 21% in mean

performance between posttests. The overall vocabulary gain of the two groups has little difference ($\chi^2 = .47, df = 1, p \leq .49$). Herman (2003) found that L2 learners can indeed acquire a significant amount of lexis through a holistic, meaning-focused reading of literature, and that following receptive and productive vocabulary elicitation, tasks extend to the acquisition of both passive and active vocabulary. Herman concluded that when students learn words collocationally in a holistic context, there is a much greater possibility that word meanings will be acquired more fully and that when restructuring is needed, it will occur with greater ease and stability.

Incidental learning is not about intentionally planned learning or knowledge that is the focus of learning whereas implicit learning is about information that is the goal of a learning activity without being formally identified to the subject/learner. It is simply expected that the subject learns it as a by-product of the overtly identified and stated activity while it appears to be an inevitable step toward the expressed objective.

2.5.2.2 Explicit learning of vocabulary.

Explicit learning is the specifically planned learning of a clearly specified form of knowledge in which the subject is overtly advised or even guided to strive and commit the specified element to memory. Intentional learning becomes explicit when the learners are clearly informed about what activity they are to perform and what objective(s) they are supposed to attain by the end of the activity, without any essential part whatsoever hidden or obscured. According to Hulstijn (2003), intentional learning occurs when the learner is clearly informed that he will be tested at the end of an activity (e.g.

vocabulary), it “involves awareness at the point of learning by trying to understand what the function of a certain language form is.” DeKeyser (2003) defines it as “a more explicit [overt] process whereby various mnemonics, heuristics and strategies are engaged to induce a representational system.

In grammar, an instructional treatment is explicit if rule explanation forms part of the instruction (deductive) or if learners are asked to attend to particular forms and try to find the rules by themselves (inductive). It is obvious that the task of explicit learning is to the point that the degree of mental activity seems to be determined by the level of guidance given in the instructions. Explicit teaching is generally given an edge as reflected in Coady et al.’s (1993) study described below and others.

Coady et al (1993) investigated explicit instruction in high-frequency vocabulary and its effect on ESL reading comprehension. The subjects were 42 students of diverse proficiency levels enrolled in an intensive English program at the university level. Twenty-two subjects were assigned to the experimental group and the twenty others to the control group. The study was carried out in two phases. In phase one, all the students completed a 36-item multiple-choice vocabulary test based on the basic vocabulary list and the Degrees of Reading test from the College Entrance Examination Board (CEEB) originally created for native speakers. Both groups received English instruction. In addition to the common treatment, the experimental group used a computerized vocabulary learning program for one hour every week and over a period of eight weeks. Each time, the program presented the students with 20 words from the 600-2,000 most frequent words. The students would access the computerized enhancements to the words

unknown to them. Any selected or missed word is recycled into a personalized file for the student. At the end of the eight weeks, all the participants completed the same vocabulary, and reading measures were used for the pretest. In the second phase of the experiment, the vocabulary was randomly selected from the computer program, and the reading comprehension measures as well as the reading texts were altered. The experiment was concluded with a short closed-ended questionnaire as an evaluation of the computer program. The results show that in phase one, the students in the experimental group experienced significantly greater gains in both reading comprehension and vocabulary knowledge ($F(41, 1) = 9.55, p < .005$). In phase two of the experiment, the students significantly increased their reading comprehension and vocabulary scores as shown by the t-tests ($p < .05$). The majority of the participants indicated that they enjoyed using the program and felt that it helped them to learn vocabulary and improve their reading comprehension. The study clearly showed a link between reading comprehension and vocabulary, and Coady et al. (1993) concluded that explicit learning of vocabulary will be more beneficial and lead to longer retention as effective vocabulary needs to be automatic and easily retrievable from memory. This is a clear point of distinction between explicit and intentional learning, just as it is between implicit and incidental. Now what is explicit learning and which one leads to better comprehension and retention?

2. 5. 3 Implicit learning of languages.

Mostly, the description and work on implicit learning focuses on its so-called “passive” characteristic and not consciously directed nature while in fact implicit learning is not passive, but simply not the overt focus of the activity. Implicit learning is defined by Ellis, N. (1994) as “the acquisition of knowledge about the underlying structure of a complex stimulus environment by a process which takes place naturally, simply, and without conscious operations” (p. 1). Implicit learning is making the description and work on implicit learning focus on its pervasive and not consciously directed nature. In this framework, Ellis adds that knowledge attainment is a non-conscious and automatic abstraction of the structural nature of the material arrived at from experience of instances. This implicit learning is a covert or not explicitly specified process expected to occur as a by-product of an overt one. The subjects are exposed to information and acquire knowledge of that information simply through that exposure or through carrying out another but overtly defined objective. Some language acquisition researchers suggest that much of the information learned during the normal course of life is learned implicitly, in the absence of conscious awareness (Krashen, 1985; Rott et al., 1999; Zahar et al. 2001).

Ultimately, even though implicit learning is not as passive as it is described, Ellis (1994) supports that the process of detection of environmental patterns that help implicit internalization of knowledge will occur only in structured and attended input domains. This tendency explains why, even in implicit learning situations, instructors provide stimuli and plan activities that become the focus of attention while the actual target of the learning process is at a different level, and the learners determine it as a prerequisite to

being able to achieve the overtly expressed objective of the activity. That overt goal is in fact only a “vehicle activity” portrayed by the instructions as the real goal of the task. In the present study, implicit learning is so termed simply because the real goal of the activity is not made explicit to the learner but is designed to constrain the learner to finding a way of successfully doing the task. As Long and Robinson (1998) explain that implicit learning is the outcome of a shift of attention to linguistic code features triggered by perceived problems with comprehension or production, or around focal *noticing* to use Schmidt’s (1990) term. In this process, learners acquire vocabulary incidentally, as a by-product of their goal of comprehending the text or clicking on the target words in order to be able to proceed to the next screen or part of the activity.

For Robinson (1996), there is no evidence that what is learned under implicit conditions is unconscious, as information is processed actively in the mind, following the procedure of attending, noticing, and rehearsal in memory. The learning environment is set up in such a way that the implicit but actual goal of the activity cannot go unperceived. A number of other researchers further emphasize the importance of focused attention in implicit learning. Hulstijn (2003) recommends that the distinctions between incidental and implicit on the one hand, and between intentional and explicit on the other, be maintained as “learning is incidental when it refers to the learning of one stimulus aspect while paying attention to another. It is learning one thing when the learner’s primary or apparent objective is to do something else” (p. 357). This is what is termed implicit in the present study. In a similar vein, in his 2003 experimental study, Herman hypothesized that participants who read literature focusing on meaning will acquire more

vocabulary words than subjects who intentionally do so via memorization and those who acquire vocabulary incidentally through reading literature will exhibit higher retention rates than those who use memorization. Herman found that L2 learners can indeed acquire a significant amount of lexis through a holistic, meaning-focused reading of literature. According to Ellis (2002), instruction can aid the acquisition of implicit knowledge. When form-focused instruction results in the acquisition of implicit knowledge, the effect is durable. Because of the degree of attention initially allocated to the commitment of the implicit knowledge into memory, this knowledge might have created stronger memory traces, which can explain why internalized implicit knowledge becomes part of the long-term memory. This retention is what the present study tries to investigate by measuring its impact at two different points in time.

2. 5. 4 Explicit learning of languages.

In comparison with implicit learning, explicit learning is structured quite differently. Ellis, N (1994) defines explicit learning as “a more conscious operation where the individual makes and tests hypotheses in a search for structure that can be attained through selective learning” (p. 1). In the explicit mode, learners search for information, build then testing hypotheses. Explicit learning occurs via given rules through explicit instructions. In his comparison of the two ways of learning vocabulary, Ellis states that “teaching intervention is less relevant to implicitly learned skills while it is essential to learned ones”(p. 2). For Schmitt (1997), the explicit learning condition is the explicit intention of learning and retaining lexical information. Explicit language

learning is the specifically planned learning of a clearly specified form of knowledge in which the subject is overtly advised or even guided to strive and commit the specified element to memory.

Intentional learning becomes explicit when the learners are clearly informed about what activity they are to perform and what objective(s) they are supposed to reach by the end of the activity, without any essential part whatsoever hidden or obscured.

According to Hulstijn (2003), explicit learning occurs when the learner is clearly informed that he will be tested at the end of an activity (e.g. vocabulary), it involves awareness at the point of learning by trying to understand what the function of a certain language form is. DeKeyser (2003) defines explicit learning as a more explicit (overt) process whereby various mnemonics, heuristics, and strategies are engaged to induce a representational system. This last definition seems to be better adapted to explicit teaching not only due to the specification of the end goal but also the commitment to a specific process that is viewed as the means to attain the overtly stated and actual objective of the activity.

DeKeyser (2003) adds that in grammar instruction, an instructional treatment is explicit if rule explanations form part of the instruction (deduction) or if learners are asked to attend to particular forms and try to find the rules by themselves (induction). It is obvious that the task of explicit learning is defined by the degree of conscious mental activity and determined by the level of guidance given in the instructions. Ellis (2002) maintains that explicit instructions may help the learner to notice features in the input that would otherwise be ignored. It may facilitate the process of noticing the gap and can

contribute indirectly to interlanguage development by providing “hooks” on which to hang subsequent implicit knowledge. Explicit instructions can also be converted directly into implicit knowledge, with “implicit” here meaning automatized knowledge. Ellis (2002) cautions, however, that explicit knowledge is no substitute for implicit knowledge. Even though Ellis’s position links implicit and explicit knowledge, there is a major difference between them in that his theory focuses on the result while that of the present study focuses on the process of implicitly or explicitly gaining that knowledge. Part of what Ellis calls implicit knowledge is knowledge that has been already acquired, integrated, and automatized in the learner’s system. Finally, a major difference between these modalities is doubtless that of the intention and allocation of attention accrued to the task, but what is the contribution of attention in the process of learning vocabulary?

2. 5. 5 Bidimensional framework.

Hunt and Beglar’s (2005) propose a Framework for Developing EFL Reading Vocabulary that provides good practical guidance in the choice of modalities, procedures and elements that may be associated in the teaching of foreign language vocabulary as it stratifies and shows the types and levels of interaction that can be established between and among the different elements involved in the teaching and learning of foreign language vocabulary. The framework focuses on both implicit and explicit modes of teaching vocabulary supplemented with vocabulary learning strategies, as also suggested by Ellis (1994) according to whom “diverse areas of research reveal that vocabulary acquisition neither depends solely on implicit learning, nor does it purely reflect explicit

learning” (p. 12). The explicit mode consists of the study of decontextualized lexis for acquiring, consolidating and elaborating vocabulary, with the use of dictionaries and inferencing meaning from the local context. The implicit mode consists of meaning-focused reading that engages the development of vocabulary size and fluency from extensive reading and why not intensive reading as well! Even though English as a Foreign Language (EFL) and French as a Foreign Language (FFL) (“Français Language Etrangère”) are different (languages), the goals and objectives of developing reading vocabulary as summarized in the chart can apply to both, as well as can be extended to the improvement of a higher level of vocabulary.

In the chart, overarching the whole process is the definition of the ultimate goals and objectives aimed at by the act of teaching vocabulary. At the next stage is the assessment of the vocabulary knowledge and vocabulary skills of the learner, both in order to diagnose and determine where to start as well as to informatively determine the outcome of the action. Next in the chart is the choice of an explicit or implicit mode of teaching or learning, reinforced with appropriate learning strategies. The chart shows that, in developing EFL reading vocabulary, the goals and objectives are to be kept in mind, in the process, at all levels, and serve to guide the different kinds of decisions that need to be made. In short, all the aspects should be fine-tuned to the goals and objectives.

The learners’ vocabulary knowledge and skills need to be assessed at the onset and at the end of the pedagogical intervention in order to determine what they know, what they can do and how they can do it. The results will be determining in deciding which of the implicit or explicit mode has to be used without excluding each other totally.

Both modes are preferably supplemented with learning strategies. The implicit instruction mode is presented as more appropriate for meaning-focused reading that aims at increasing vocabulary size through extensive reading to develop fluency. The explicit instruction mode is more appropriate for inferring meaning from context, using dictionaries to find meaning and beyond, and for studying decontextualized lexis. The study of decontextualized lexis is used for acquiring new vocabulary, consolidating previously met vocabulary, or elaborating vocabulary knowledge.

The goals and objectives interact with the type of assessment and skill to investigate; and the assessment and skills interact with both of the instruction modes which also interact with each other. Hunt and Beglar's (2005) framework outlines a trilogy of assessment, instructional mode, and activity type. The goals and objectives; the assessment of pre- and post-activity knowledge of vocabulary and skills; and the application of instructional modes to practical vocabulary learning can impact each other. Unfortunately, the framework does not specify which type of assessment, and it would be more precise to clearly define the assessment types as diagnostic and informative as it is necessary to know where to start and when to evaluate the outcome of the learning practice.

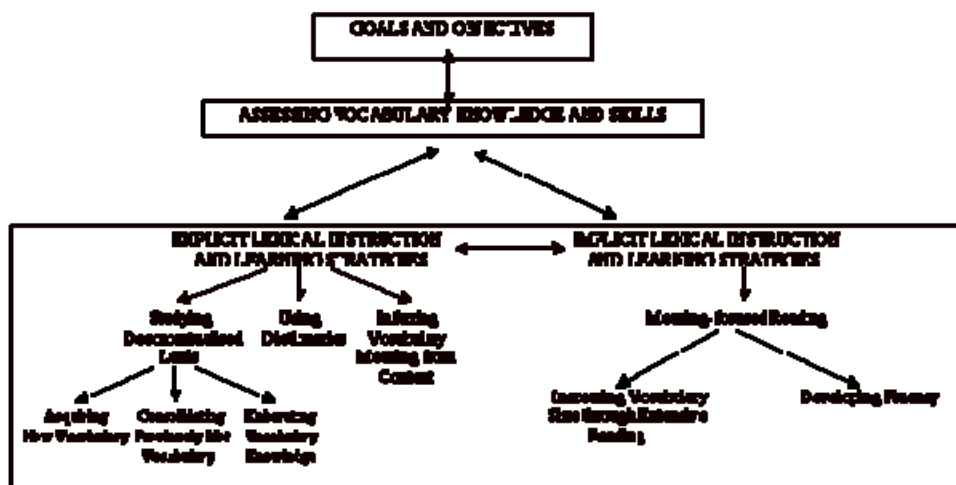


Figure 1: *A Framework for Developing EFL Reading Vocabulary* (Hunt and Beglar, 2005)

This framework reiterates the Second Language Vocabulary Research view according to which explicit learning of decontextualized vocabulary in an early stage is valuable in foreign language reading and that programs that incorporate more direct instruction have been found to be more effective for vocabulary development than those that rely exclusively on indirect means of instruction. It also supports that explicit lexical learning strategies enhance noticing and provide opportunities for recycling.

2. 5. 6 Grammar-based implicit and explicit teaching.

In the field of grammar and based on the definition of implicit and explicit provided by DeKeyser (1995), Norris and Ortega (2000) gathered a number of studies that compared explicit and implicit instruction or error correction according to which an instructional treatment is explicit if rule explanation is part of the instruction or if the learners are asked to attend to a particular form and try to find rules by themselves.

Norris and Ortega (2000) insist that “when neither rule presentation nor directions to attend to a particular form were part of a treatment, that treatment was called implicit” (p. 321). Doughty and Williams (1998), Long and Robinson (1998), and Norris and Ortega (2000) suggest that there is a positive role for some kind of attention to form either through explicit teaching, explicit error correction, or indirect means such as input enhancement.

Contradictorily, DeKeyser (1994) claimed that implicit [grammar] learning would be equal to or better than explicit learning in certain cases but how would that be in the case of vocabulary? It may be possible that because of the deep processing that occurs when trying to solve a lexical problem (Hulstijn et al., 1996), the implicit learners, less individual differences and certain applicable conditions, may retain what they have internalized longer than would the explicit learners who would process the activity promptly because of the explicit instructions and clear guidance. They may not retain what they have processed for a longer period time than would the implicit learners because of the limited-effort processing associated with it (Paivio, 1986).

Wode (1999) studied whether there is evidence to suggest that the learning abilities activated in the Immersion class (IM) when the EFL learners are set to learn vocabulary as a by-product of being immersed in English through the teaching of a different subject with English are different from those activated in the traditional classroom. The program was at an English Immersion school with regular versus reduced amount of exposition in a German University, where in that program, English is used as

the language of instruction in learning other subjects. The study was experimental with two control groups and one experimental group in each comparison group.

The program started with the regular English-as-subject at grade 5. Students getting into the program received two extra periods of instruction for the next two years of preparation, and immersion are introduced at age 12. For one of the options, the additional period was retained in grades 7 and 8 but not in grades 5 and 6. For another group, the immersion was limited to a maximum of two subjects; either history, or geography, or both. The number of students per class ranged from 21 to 29. A pilot study was organized. Three cohorts, each constituted of one immersion class, one non-immersion class from the same school, and one non-immersion class from another school but from the same city participated in the study. There also were three options in the immersion classes: one with limited immersion, another one with reduced immersion, and the third one with minimal immersion.

In the oral testing procedure, the students were given a rudimentary map of the area of an event plus a summary of the hypothetical situation and their task of solving the dilemma. Only three lexical items were glossed in German. The students were given 15 minutes to read the instructions and be familiar with the topic. In addition to that, the interviewer may have provided them with further explanations and encouragement if needed. Data from grade-7 participants were collected and lexical analysis of their productive vocabulary was done. With respect to incidental vocabulary acquisition, five noteworthy outcomes were reported: the experimental groups used a considerably larger vocabulary than the control groups; the size of the vocabulary used was not restricted to

any preference; the immersion students produced a greater number of lexical items than the two other groups; the immersion group produced more synonyms than the two other groups; the immersion group used more lexical items that could not possibly have come from the grade 5-7 English textbooks, from the wording of the task in the test or from the interviewer's explanations. The immersion group's vocabulary production was more diversified than that of the comparison triads. They used a greater degree of differentiation and a greater number of synonyms than the comparison groups.

The author concluded that learning a second language was based on the same acquisition abilities as demonstrated by the immersion group. Incidental learning seems to be the base on which the immersion group outperformed the control group, and this supports the assumption that contingencies of naturalistic L2 acquisition also apply to immersion. This expectation can also be extended to a vocabulary acquisition environment in which naturalistic strategy underpins the activity.

Scholars such as Krashen and Terrel (1983), and Asher (1977) support the notion of implicit grammar teaching while Omaggio (2001), Rivers, McLaughlin (1990; 1996) stress explicit teaching of grammar as vital for successful foreign language learning. Most studies in this line focus on the teaching of grammar, but those that focus on the teaching of vocabulary are relatively limited in number. Some studies in the field of grammar that compared the two methods of teaching found no significant difference between the implicit and explicit modes. In order to attempt the provision of further pedagogical advice, Scott (1989) investigated the explicit and implicit teaching of

grammar in a classroom environment. Explicit teaching was defined as explaining a given language structure directly as a set of rules, and implicit teaching as presenting a language item in context without formal analysis for the students to grasp its meaning and function. The target language structures were the relative pronouns in French. The students' performance was assessed through oral and written tests. The subjects were thirty-four advanced students in two intact classes of French conversation with at least three semesters of college French at a US university. The course in which they were enrolled emphasized general communication. Grammar was not a focal point. A non-native instructor with native-like fluency taught the class. The target items were the relative pronouns (qui, que, dont, ce qui, ce que, ce dont) and both form and usage of the subjunctive. All the subjects had met the target structures before.

The investigation had two distinctive parts: the first part was allocated to the pronouns and the second one to the subjunctive. The two classes were alternately exposed to either the implicit or the explicit teaching conditions so that both were equally exposed to both conditions. In the explicit condition, the students were exposed to an explicit presentation of the target structure, giving the rules followed by teacher modeled examples. In the implicit condition, the students heard a story in which the target structure was repeated many times. At the end of the reading session, the students worked on comprehension questions without prior oral or written practice of the target structure. Learning was tested through oral and written pretests and posttests. As a difference of score was noted in the pretest, gain scores were used to assess the progress made by

subtracting the pretest score from all every other score. Oral, written, and total gain scores were computed separately.

In the oral section of the test, the investigator found no significant differences between the two groups. But in the written sections, there was a strong trend toward significance. With both target structures and in the explicit condition, both groups performed better than those in the implicit condition. Scott (1989) concluded that regardless of the level of ability of each group, the test scores of the students who were taught explicitly improved more than those of the students taught implicitly. Presumably the students who were taught traditionally may have been comfortable with the explicit teaching method. The length of time in teaching explicitly may have allowed better digestion to the explicit group students; and finally, the spontaneity of the responses could have advantaged the explicit group and put at a disadvantage those in the implicit group who did not have items well organized under headings. Scott (1989) attributed the limited gain in the oral tests to the limited time available for editing in oral language. This situation could have put the students at a disadvantage. Scott affirms that as the implicit group students focused on the content, “they clearly understood and remembered numerous details, even long after the research experiment was over.” Scott (1989) concluded that as the study was exclusively carried out in the classroom setting, there is a need of further experimental research to define the theory and practical application of explicit and implicit teaching strategies.

2. 5. 7 Production and recognition.

For Ellis (1994), recognition and production aspects of vocabulary learning rely on implicit learning, but meaning and mediational aspects of vocabulary heavily involve explicit, conscious learning processes. To the extent that vocabulary acquisition amounts to learning surface forms of language, it is an implicitly acquired skill. Citing Kirsner (1994), Ellis presents the discussion that focuses on theoretical questions associated with the role of exercise, morphology, modality and meaning in vocabulary acquisition and psycholinguistic analysis of the critical role of implicit processes in the acquisition of vocabulary. The mapping of input/output to semantic and conceptual representation is a cognitive mediation dependent upon explicit learning processes. Kirsner (1994) also contends that the lexical system is partitioned by modality, where: separate systems of representation are developed to facilitate the communication of symbolic information for each modality such as for example printed language, spoken language, signs, objects, and that classification of any one stimulus necessarily involves reference to representations defined by both the input modality, for perceptual analysis, where this is defined by stimulus modality, and the output modality for pre-motor planning where the latter is determined by the task and /or response demands as distinct from the stimulus modality.

2. 6 Vocabulary Learning and Strategy Use

Vocabulary acquisition is also favored by the interaction of reading and strategy use as is supported by Fraser (1999), and Beglar and Hunt (2005). In his study, Fraser investigated lexical processing strategies used by L2 learners when they encounter

unfamiliar vocabulary while reading for comprehension and the impact of these strategies on vocabulary learning. The lexical processing strategies (LPSs) refer to the options that an L2 reader can exercise when confronting an unfamiliar word, namely ignoring and continuing to read, consulting a dictionary, or inferring the meaning on the basis of linguistic and contextual cues (Hulstijn et al., 1996). The study focuses on the description of lexical processing strategies, the impact of LPS-focused instruction on LPS use, reading rate, reading comprehension and vocabulary learning. The study attempts to find out if: 1) the LPSs adult L2 learners use are potentially productive for vocabulary learning; 2) if LPS-focused instruction affects word learning; and 3) if different word retention rates are associated with reading proficiency, LPS use, or previous familiarity with the word. Eight (8) francophone intermediate learners of ESL from a class of 19 English for Academic Purposes at the university level participated in the study. Their prior knowledge was measured with Nation's (1990) Vocabulary Levels Test; the Institutional TOEFL, Section 3; and the Education Testing Service's (1992) Vocabulary Reading Comprehension task. The eight volunteers were classified as either higher or lower levels of English reading proficiency. The study was carried out in two phases over a period of one month. Each of the two phases consisted of approximately 4 hours of in-class and 4 hours of out-of-class instruction. The first phase one focused on developing students' awareness of the use and viability of the three Lexical Processing Strategies (LPS) options through metacognitive strategy training, and an explicit and direct approach. Phase two focused on effective inferencing procedures, namely instruction on cognates, word structure, grammatical function, lexical cohesion, and structural

redundancy. The treatment was integrated into the course. Participants met individually with the researcher nine times over five months for one training and eight data-collection sessions. And these meetings represented four measurement periods: baseline, after metacognitive strategy training, after language-focused instruction, and a delayed measure given one month after the end of the instructional treatment to assess maintenance (retention).

In the data collection sessions, the subjects first studied comprehension questions, read an article, answered comprehension questions, and skimmed the text to identify unknown words. Then they individually participated in oral interviews meant to elicit a retrospective think-aloud protocol on how they dealt with the unfamiliar while reading. One week after each task, the participants completed a cued recall task to monitor the effect of instruction on word learning focused on 109 target words selected from a list of what a participant indicated as unknown on a five-point scale. A maximum of 15 words per participant, per text was analyzed. It was found that inferencing was the preferred as well as primary strategy used by the participants to this study. They inferred more than they consulted dictionaries and consulted dictionaries more than they ignored unknown words. When participants inferred alone, they remembered the word about 30% of the time but when they inferred and consulted a dictionary, they remembered about 50% of the time, the meaning of the inferred and looked up word. They recalled 42% of the words they indicated having seen before but not remembering, but only remembered 25% of the ones that they had not seen before.

Fraser (1999) concludes that reading comprehension in an L2 can be productive for incidental vocabulary learning. Instruction focusing on enhancing lexical processing strategy use did have an indirect effect on vocabulary learning. The participants increased the number of inferences that were based on linguistic and situational context of the text and the inferences became more and more appropriate. The LPS-focused instruction seemed to increase the underlying conditions needed for effective vocabulary learning while reading and retention was at the rate of 28% as opposed to Krashen's (1989) and Hulstijn's (1992) rate of 7% after a single encounter without prompts to infer. (Paribakht and Wesche's (1997) reports a retention rate of 11% for verbs and 24% without prompts to infer while Hulstijn's (1992) study reports 13% and 17% as a result of prompted and guided inferencing.

For Paribakht and Wesche (1997), the strong relationship between vocabulary knowledge and reading comprehension ability holds at all levels of literacy and education for both L1 and L2 learners. They describe reading as being both the cause and consequence of reading comprehension (Nagy, Herman, and Anderson, 1985; Nation and Coady, 1988; Stoller and Grabe, 1993). In order to discover more information on the incidental acquisition of vocabulary, Paribakht and Wesche (1997) conducted an experimental study with pretest and posttest in which 38 intermediate-level university students learning ESL participated. The participants were divided into two groups. The first group received a Reading Only text treatment and answered comprehension questions while the other received Reading Plus treatment and carried out text-based

vocabulary activities on the same target words. Gains by the two groups were measured with a pretest and posttest of the target words list using the Vocabulary Knowledge Scale (Paribakht and Wesche, 1993; Wesche and Paribakht, 1996), an instrument developed by the researchers and that measures the number of words known by the learners. It also identifies the different levels of knowledge ranging from recognition of the word form, to the recognition of its meaning, and the ability to use the word with grammatical and semantic accuracy in a sentence. The participants read a total of four texts on two themes. Multiple exposures and enhancements to a number of nouns, verbs, and discourse connectors were provided by the text. Those words are generally identified as unfamiliar to students at this level of ESL proficiency.

In the results, the comparison of known and unknown words before and after the instruction on the Vocabulary Knowledge Scale indicated significant gains in both groups, with the Reading Plus group gaining more than the Reading only group. The Read Plus group gained 40% of nouns, 33% of verbs, and 36.6% of content words, while the Read Only group gained 24% of nouns and, 11% of total content words. The Reading only group's gain remained at the recognition level while that Reading Plus group members were able to write sentences using the new words. The authors conclude that although multiple encounters with given words during reading leads to increased knowledge of the words, a combination of reading and text-based exercises demanding different kinds of analysis and practice of the words is more effective for vocabulary learning.

2. 6. 1 Strategy use.

In addition to the traditional learning strategies by Oxford (1990), O'Malley and Chamot (1990) and others, Thompson (2004) provides a list of useful strategies for aiding vocabulary instruction and vocabulary learning. These strategies include mnemonic techniques for aiding memory in retrieval; the keyword method which helps to link sounds, words, shapes, and more; visual mnemonics to match words with pictures; visualization, a technique used to keep the graphic appearance of a word in mind and thus reinforce memory trace. Thompson (2004) also provides physical mnemonics acting words out; grouping words around common or associative criteria; elaborating and relating words to others terms and notions; self-assessment through recall; learning terms related to one's interest; reviewing, and constant real-life practicing. The process however can go through an intentional explicit mode or an incidental implicit one. As for the presentation of new information to students, Finkbeiner and Nicol (2003) recommend that new words are introduced semantically or syntactically unrelated as using local cues puts less strain on short-term memory and gives more indication on target word meaning than using global cues. However, new vocabulary items need to be presented in meaningful contexts, and learners should use deep mental elaboration on a new word's form and meaning in order to facilitate and/or extend retention.

2.7 The Role of CALL in Learning Vocabulary

2.7.1 Research in CALL.

CALL pedagogy has been articulated on the basis of social and cognitive concerns about second language learning as suggested by Chapelle (1998), and the basic assumption is that the learner should be working with texts and should be on tasks that require him or her to attend to the meaning of language. Research has shown that individuals are different from each other and have different language learning styles: cognitive, affective, perceptual and physiological (Egbert 1999). These learning styles need to be accommodated so that they enhance rather than inhibit the learners' ability to acquire vocabulary, and Computer Assisted Language Learning (CALL) has the capacity of facilitating this. In the vein of his support for the use of technology for vocabulary learning, Nation (2001) states the following:

“ Computer-Assisted Vocabulary Learning (CAVL) can help fill many of the requirements for rich instruction, (...) [and] it is also worth considering the flexibility of computer programs in adapting to student needs, to environmental constraints, and in modifying the learning principles” (p. 108).

Computers can help to address the various learning styles by presenting information in different forms, and by adding saliency as well as giving the student control over the learning process by individualizing instruction and adapting it and the material to the learner and environment by using different types of media. The use of multimedia, defined in a previous section as a program or information environment that

uses computers to integrate text, graphics, images, video, and audio can address the students' numerous learning styles as they can be combined in an interactive way. This dual modality or multi-modality is beneficial for all learners even in a single group, because each has something applicable to his or her style(s) and can personalize it. This "multimodality" will be addressed in the many dimensions of the teaching/learning environment and resources such as the hardware, software or simply the courseware, the theory of language, theory of language learning, teaching approach, method, principle, styles, and knowledge of the learners and use of the appropriate material, among others; with elements hyperlinked in a non-linear way. Additionally, it is fortunate that today's multimedia computers can present language games, simulations, problem-solving activities and a large variety of activities at the point of motivating all learning styles. Consequently, CALL materials production has moved from single learning style-based to more open-ended and interactive programs that make optimal use of the computer's capabilities. The computer allows for providing in a variety of forms that can help the learner to interact with the material and probably learn more than without this help. There is a wide array of options that include dynamic or static images, L1 translations, L2 dictionary definitions, simplifications, animations. These are incorporated as glosses hyperlinked to various sources and exponents.

2. 7. 2 Second language acquisition and multimedia learning.

As presented by Plass and Jones (2005), the acquisition of second language with multimedia includes "input competencies, such as listening and reading, and output

competencies, such as speaking and writing, and entails the process of receiving input, attending to interaction, and assigning meaning (output) to verbal (aural or written) and/or visual stimuli” (p. 467) as well as to communicate in the target language. They define it as “the use of words and pictures to provide meaningful input, facilitate meaningful interaction with the target language, and elicit meaningful output” (p. 469). The use of hyperlinks on target items comprised in the text provides helpful information in the form of translations, descriptive sentences, background information, pronunciation guides, images, or video. These provide additional facilitation for the interaction with the target text. The whole may serve as a starting point for discussion, argumentation, and negotiation of meaning which ultimately allows the students to achieve reception and chiefly a production of some kind. In the next section, I will discuss the multimedia presentation, condition that favors a type of multilevel and/or deep processing.

Roby’s (1999) taxonomy of glosses (see Appendix I) that include gloss authorship, types of presentations, gloss functions, focus, language and form in an almost exhaustive way, captures most of the aspects used in a great number of research studies, and is used as a framework for the choice of annotation types for this study. For practical reasons, however, this repertory of glosses is simplified as in the chart shown below as the actual use of annotation in specific circumstances can be, compared to the operational question WHO WANTS TO ACHIEVE WHAT, UNDER WHICH CIRCUMSTANCES, AND WHY? This conceptual decision will structure and inform the appropriate combination of given elements of the chart as will be operationally and concretely usable in a study and a more operational one as described and shown in the next paragraph.

The present study takes Roby's (1999) taxonomy of glosses one step further by operationalizing the constituent elements and as can concretely appear and can be viewed on computer screens or heard of listened to from loud speakers. The operationalized chart is organized as follows: All the annotations fall into one of visual or verbal categories. The verbal category can be further divided into spoken or printed categories. The spoken category takes an auditory form and can be heard or listened to as sounds of different types. The printed category is in written form and can be read as text of various types as well as in a variety of languages (L1, L2, L3, etc). The annotations of the visual category are graphic and either static or dynamic. The static graphics can be photographs presented as diagrams or maps presented as graphs. As for the dynamic graphics, they can be either various computer animations or videos in different movie types.

In summary, the choice of annotations can be made among six different categories: 1) sounds of various types; 2) texts in various types, modalities and languages; 3) diagrams of different sorts, 4) graphs of different kinds; 5) various types of computer animations; 6) and different types of movies, as can be seen in the lower row of the diagram, and can be combined as needed.

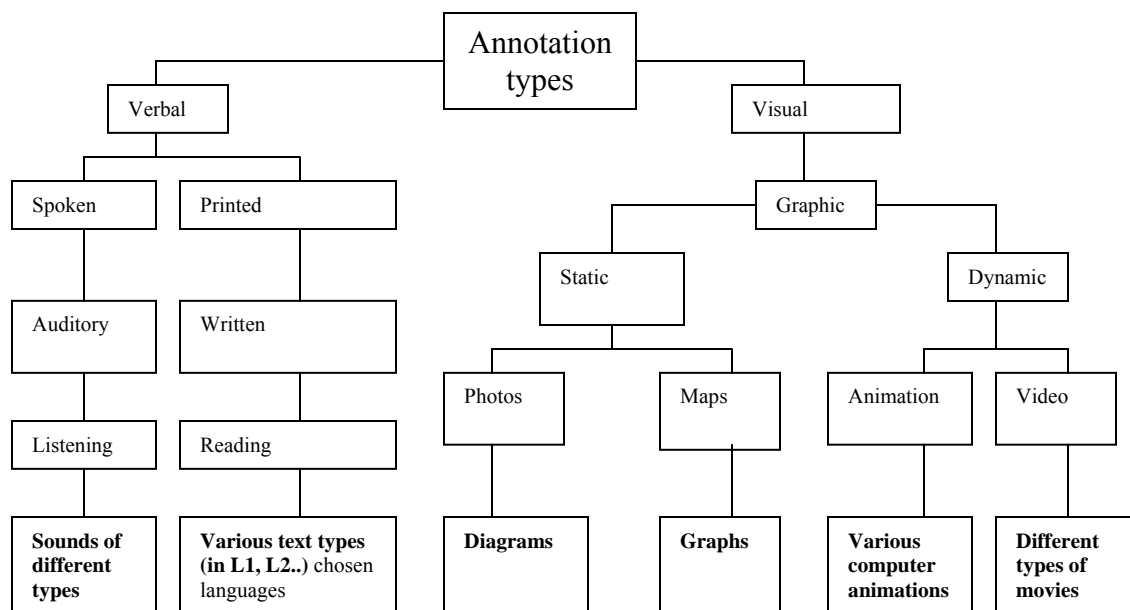


Fig 2: *Simplified Taxonomy of Glosses.*

1. 7. 3 Glosses.

Glosses are enhancements that are used to provide additional information on specific parts of text in order to facilitate understanding and manipulation of unfamiliar information. According to Nation (2001), glossing allows texts to be used that may be too difficult for learners to read without glosses. Enhancements provide accurate meanings of words that might not be guessed correctly and provides minimal interruption of the reading process. Beyond the traditional text enhancement on paper CALL environment provide multimodality enhancements that are hypertext via the computer or the net. In the hypertext environment, glosses give instantaneous access to textual, and visual information and images attached to a word, enable readers to confirm or reject hypotheses made about the meaning of a word, and provide opportunities for readers to

interact with the text. As vocabulary learners tend to build visual and verbal cues for retrieving stored information from memory, using these cues in learning can facilitate both storage and retrieval of information when needed. A multimodal presentation of vocabulary can accommodate a variety of the individual learning strategies and reduce the level of difficulty. The computerized glosses can be accessed thanks to hyperlinks. In terms of the type of annotations, the present study operationalized Roby's (1999) taxonomy of glosses from which three relevant types are used.

2. 7. 4 Visible and invisible glosses.

Regarding the use of multimedia glosses, Davis (1989) notes the characteristics of glosses that allow readers to obtain as much or as little information as they desire on a particular concept or word mentioned in the text under study, as well as the use of invisible glosses that do not interrupt the reading process. De Rider (2002) and Nikolova (2004) on their sides examined the use of visible feature of hyperlinked enhancements.

De Ridder (2002) investigated the effects of highlighted of the hyperlinks on incidental vocabulary learning, text comprehension and the reading process. Sixty second-year economic students aged between 19 and 21, computer literate and first language speakers of Dutch participated in the study. She found that the signaling-mode of electronic glosses has an effect on vocabulary learning, text comprehension and the reading process. It motivates the foreign-language learners to consult the gloss but does not slow down the reading process or increase the vocabulary learned incidentally. It does

not particularly have a positive effect on vocabulary learning or text comprehension. Apparently, the readers seem to adapt their reading and vocabulary learning strategies to the screen-situation they are confronted with. The reading task then does not alter the clicking behavior of the students since they still click considerably more when visible links are presented, even when carrying out a specific reading task. She supports, however, that a content-oriented reading task seems to decrease the reader's attention for vocabulary, thus having an overall negative effect on vocabulary acquisition.

Nikolova (2004) studied the effects of visible and invisible hyperlinks on vocabulary acquisition and reading comprehension for high and average foreign language achievers. 143 high achievers and 119 average achievers and all native speakers of Bulgarian learning French at the university level participated in both visible and invisible conditions. Half of each group participated in one or the other treatment groups. All subjects read the text for general comprehension. The visible link group had highlighted hyperlinked words with access to Bulgarian translations and was informed about it. The invisible link group was only told that some words were hyperlinked to Bulgarian translations but were not marked. Each group took the pretest, wrote a recall, and solved a simple math problem before taking the immediate posttest of vocabulary and reading comprehension, as well as an identical post-test with random rearrangement of the vocabulary words two (2) weeks later. It was found that average achievers perform better when they have marked hyperlinks than when they have invisible hyperlinks but this condition does not make a difference for high achievers. This finding supports the claim that attention and conscious awareness toward the link between form and meaning

leads to a better retention of the foreign word as supported by Mondria and Wit-de Boer, (1991) and Beaton, Gruneberg, and Ellis' (1995).

2. 7. 5 Hypertext in vocabulary learning.

In this section the terms hypertext and hypermedia will be used alternately even though they are not exactly the same. This association is merely due to the fact that hypermedia uses hypertext and hypertext is part of hypermedia.

Jones' (2003) study intended to extend Mayer's (1997, 2001) generative theory of multimedia learning highlights the effectiveness of multimedia annotations in assisting students in the comprehension and acquisition of vocabulary from aural text. She found that overall students remembered word translations and remembered the passage best when they had selected both verbal and visual annotations. The availability of verbal and visual annotations enhances students' ability to comprehend material and acquire vocabulary. According to Jones (2003), research on comprehension of written texts in multimedia environment (Chun and Plass, 1996a, 1996b, 1997a; Plass et al., 1998) suggests that when students access multiple annotation types (visual and verbal) that accompany a reading comprehension passage, learning is more likely [to happen]. In their studies, they found that students who had access to visual and verbal annotations performed significantly better than those who received verbal annotations alone. She also mentioned that visual annotations have the strength for attaining deeper level of understanding. It gives them multiple avenues for recalling information from memory

Dillon and Jobst (2005) reviewed a number of reviews of the literature on hypermedia and learning, the ability of hypermedia to make information available in a multitude of formats, provide individual control, engage the learner and cater to various learning styles and needs and make it the harbinger of a new learning revolution. For Dillon and Jobst (2005), Dillon and Gabbard's (1998) review is a landmark on the analysis and review of the diverse and extensive literature. They support that hypermedia consists of more than linked texts because it includes other forms of media such as images, video and sound, as part of what is presented to the learner; and that the learner can explore the information by following links he personally deems relevant. According to the researcher, another quality of multimedia is its ability to provide non-linear access to information, explore information on demand, provide self-paced instruction and engage actively into the task. It also has the ability to cater for various learning styles, individual information needs and provide information in a multitude of formats. Dillon and Jobst maintain that the period up to 1995 adopted a naïve associationist view of cognition and emphasized the similarities between linked information nodes and the presumed architecture of human cognition. The following period held a more critical view of hypermedia and cognition and theoretical models from education and psychology have been applied to certain aspects of its design and use. Hypermedia is not exempt from the tensions between constructivist and information-processing views of learning, but hypermedia is based on Mayer's (2001) Generative Theory of Multimedia learning that assumes that learners are limited-capacity dual encoders who actively process information in order to integrate it meaningfully with their existing knowledge. It focuses

on the modality principle according to which students learn better when visual and verbal information is presented in a congruent format. Constructivist approaches on their side focus on the context of learning, task relevance, and ability of or opportunity for learners to apply the material to be learned. After studying the reviews by Nielsen (1989), Chen and Rada (1996), and Landauer (1995) concluded that hypermedia it is generally advantageous for tasks that require rapid searching through large or multiple documents, while increased control over access to information is not equally beneficial to all users and may be detrimental to low ability learners; and particular interface designs are better suited to certain learner style, and that not all learning tasks are equally well supported by hypermedia. They suggest that individual differences should be considered in designing and implementing any hypermedia. Providing advanced organizers can aid navigation and perception of structure hierarchical structure seems to provide a suitable lay out for most users and congruency of format for visual and verbal information presentation can assist cognitive processing of most users.

Dillon and Jobst (2005) however warned that the provision of advanced organizers that can be seen as a means of rendering the structure explicit but also renders the representation complicated and difficult to use.

For Chun and Plass (1996a) on average, students recalled 77% of the vocabulary words while Jones (2003) reported 79%, and the students voiced strong opinion on the value of the amount of mental effort invested, especially in the analysis of the images. When a task is perceived as difficult, it triggers more mental efforts in solving it.

Jones (2003) reported that visual annotations allowed for deeper processing of the aural passage and thus longer retention of the material and greater vocabulary knowledge. The mapping of visual input with aural input into a mental model resulted in stronger recall than the mapping of words. The presence of visual and text annotations allowed students to select from the material and build referential connotations between the two, if not three systems, thereby resulting in more retrieval routes to the vocabulary items. The students' remarks corroborate Salomon's (1983) theory of mental effort-dependent success. The students also reconfirmed that choosing from multiple annotation types created a more individualized and balanced approach to the activity.

Chun and Plass (1996) explored the effect of multimodal glosses on vocabulary acquisition using CyberBuch, a hypermedia application for reading German texts that contains a variety of annotations for words in the forms of text, picture, and video. They specifically focused on how well vocabulary is learned incidentally when the goal is reading comprehension and on the effectiveness of different types on vocabulary acquisition. They also investigated the relationship between look-up behavior and performance on vocabulary tests. One hundred-sixty second-year American students of German as a foreign language in three American universities participated in the study. The students were divided into 3 groups: They were introduced to the program, they watched a video, read a short story while using CyberBuch with the annotations described above, they took a vocabulary test upon completing the reading, and finally,

they wrote a recall protocol They found that in spite of their merits, not all gloss types can be equally effective; for example, a dynamic video image is less effective than a static image. Referring to the transient aspect of video, they support that the short presentation time does not allow the development of a mental model of information specifying that “the pace of the presentation of the information is not sensitive to the cognitive constraint on the learner, and its transient character, therefore, does not allow the student to reflect and to refresh short-term memory.” However, they emphasize that associating lexical items with different types of media fosters richness of recall cues, and increases the likelihood of retention. Similarly, Ariew and Ercetin (2004) also found that video annotations had negative impact on reading comprehension for intermediate learners, which suggests that video may be distracting to them. Plass and Chun (1996) claims that "organizing information in working memory seems to be aided by learners making connections between the verbal and visual system, and this helps in linking information to components of the mental model in long-term memory" (p. 517). In a somewhat different way to this, Gettys et al. (2001) support the idea that providing sufficient information to the learner is better than its quantity, even though multimedia has the possibility of providing all types of annotations. Ellis (1994) states that words may easily be forgotten after the first encounter, however, explicit, deep, elaborative processing concerning semantic and conceptual or imaginal representations prevent this effect and the beneficial effect of L1 and L2 lookup may lie in the richness of semantic encoding, in the prolonged attention that multiple items of information require. Thus the different types of annotations that can be added to a text in order to provide additional

help and allow learner autonomy will not depend on the provision of as many gloss types as possible, but rather a reasonable amount and appropriate types that will neither overwhelm, nor puts limitations on certain learning strategy types.

According to Plass and Jones (2005), annotation types that are used with multimedia for second language acquisition are generally in the form of translations, descriptive sentences, background information, pronunciation guides, images, or video. They propose second language acquisition with multimedia as a combination of instructional strategies with multimedia learning theories, which they summarize in a chart (see Appendix F) that adapts Chapelle's (1998) interactional model of SLA process and multimedia theory.

This choice will comprise multimedia-based strategies that facilitate interactive processes that include lower-level (bottom-up) strategies that emphasize words, structures, and sounds and higher-level (top-down) strategies that promote visualization or inferential strategies. In this process, learners acquire vocabulary incidentally, as by-product of their goal of comprehending the input (Hulstijn, 1992; Hulstijn, Hollander and Greidenhaus, 1996; Yoshii and Flaitz, 2002). Finally, they maintain that multimedia / hypermedia needs to be semantically structured to facilitate learning by focusing on visualization, teaching and assessment. (See Appendix F) for types of annotations used by different researchers).

2. 7. 6 The effectiveness of dual annotations in vocabulary learning.

The effectiveness of multi-mode gloss types for reading comprehension and vocabulary acquisition was investigated by Yoshii (2006) with reference to Paivio's (1971, 1990) and Paivio and Sadoski and Paivio's (2001) theory of multiple modalities. Yoshii examined the effectiveness of different types of glosses on incidental vocabulary learning, focusing particularly on L1 and L2 types of glosses and wanted to know whether there is an interaction between the varieties of glosses she used. The experiment used L1 text only, L2 text only, L1 text plus picture, and L2 text plus picture glosses. One hundred ninety-five Japanese university students learning English as a foreign language at the levels of freshman, sophomore, and junior participated in the study. The subjects were randomly assigned to 4 groups corresponding to each condition. They took a pretest, before reading a 390-word text with 14 concrete and non-cognate target verbs mixed with 6 distracters on the computer. They took both an immediate posttest and a delayed posttest with definition supply and multiple-choice word recognition tasks. The immediate and delayed posttests were taken under the same condition with the exception of order of appearance of the test items in the second one. The results revealed that there was no significant difference between the L1 and L2 glosses, but there is a significant difference between the picture and no-picture groups. Further comparing the L1 plus picture group to the L2 plus picture group, the researcher found that the L1 plus picture scored significantly higher than the L2 text only group in the immediate test while the L2 plus picture scored significantly higher than the L2 text only group. The study also revealed that the definition supply tests showed significant interaction between languages

and tests while retention rates differed for the L1 and L2 in the sense that L1 plus picture declined significantly at a higher rate than the L2 plus did. For the recognition test, there were no differences between L1 and L2 glosses as well as between the picture and no-picture conditions. Participants in the L1 only condition remembered the word better than those in the L2 conditions. They retained the words they learned up to the delayed posttest. The current study confirmed the usefulness of glosses, regardless of language types, or incidental vocabulary learning (Hulstijn, 1992, 1993; Hulstijn et al., 1996; Knight, 1994; Mondria and Wit-de Boer, 1991; Paribakht and Wesche 1996, 1997; Watanabe, 1997). The L1 text only condition resulted in longer retention than the L2 text-only condition.

In their experimental study Second Language Incidental Vocabulary Retention: The Effect of Picture and Annotation Types, Yoshii and Flaitz (2002) investigated the effect of text and picture annotation types on vocabulary retention. One hundred fifty-one adult beginning and intermediate ESL learners read a web-based text for comprehension with text only (L2 English), picture only and a combination of text and picture annotations. The study had a pretest/posttest format and a between subject as well as within subject analysis. The subjects were randomly assigned to the three conditions (50, 51, and 50). They took an immediate vocabulary posttest and a delayed one (2 weeks later). The tests included Definition Supply, Picture Recognition and Word Recognition. The results showed that the combination group outperformed the two others on all three test types. The combination group was the most effective in terms of delayed vocabulary

retention, and the picture group held the second place on all the test results, except for the Definition Supply. There was not a significant difference between the picture-only and text-only conditions in the immediate tests. The researchers also found that the proficiency level difference had no effect on the group differences. The recognition test yielded a high recall rate but the production tasks did not. Finally all groups declined in the rate of retention over time but did not differ significantly from one another except for the picture only condition that declined very little. In their conclusion, Yoshii and Flaitz (2002) asserted that their study couldn't confirm Paivio's (1971, 1990) Dual-coding Theory as both textual and pictorial cues had relatively equal effects on retention, and that over time, the combination group did not retain vocabulary better than the picture-only or text-only groups taken individually.

In his discussion of implicit vocabulary acquisition, Kirsner (1994) insisted on the necessity for immersion and practice, the possibility of learning without specific models, and the use of cross-linguistic elements. In short, Kirsner reiterates the saying according to which "practice governs performance," but with certain exceptions, though. He contends that the lexical system is divided by modalities that interact with each other, among which printed language, spoken language, signs, objects, etc, on the one hand, and input modality for perceptual analysis and defined by stimulus modality, output modality, pre-motor planning as determined by task and response demands on the other. These are two serially organized information processing stages involved in naming, word

identification or lexical decision, as a summary of the information processing principle at the heart of implicit learning.

Yeh and Wang (2003) describe CALL as a potentially powerful method for increasing language learners' vocabulary size due to its capacity for multimedia presentation of glossary (information). In their study, 82 first-year students of English from the Department of Material Science and Technology and the Department of Chemistry at the National Tsing Hua University in Taiwan in their investigation of multimedia vocabulary annotations and learning styles. The subjects worked with a computerized text enhanced with; 1) text annotations only; 2) text plus picture; and 3) text plus picture and sound. Yeh and Wang (2003) found that the participants obtained better grades in the visual/nonverbal category in the text plus picture annotation group but the dual presentation plus audio annotation was relatively ineffective. They added that this relative ineffectiveness may be attributed to the influence of the L1 and the rate of speed of the audio annotations and learner strategies. They also attempted to justify it as either related to the learners' learning strategies or by assuming that the speed of the sound annotations contributed as a distractive element because the speed exceeded the participants' listening proficiency.

This study shows that for incidental vocabulary learning, the combination of textual and pictorial annotations is more effective than text-only enhancements.

In his study on second language vocabulary glossing and its effect on reading comprehension, Lomicka (1998) compared learners of French in three reading conditions. Condition 1 had full glossing including definitions in French, translations in English, images, references, questions, and pronunciation; condition 2 had partial glossing including only definitions in French and translations in English; and condition 3 included reading only, with no access to glosses. In addition to the treatment, the subjects were asked to read a poem and think aloud while working on the text and looking up the glosses by vocalizing their thought. The results showed that traditional glosses (the definitions in the two languages) were most frequently consulted but the group with access to the full range of glosses generated the greatest number of causal inferences and tacit demonstration of comprehension through an explanation in the think aloud activity in which the learner connects events in a text at a local or global level. Lomicka (1998) concluded that computerized reading or translation with full glossing may promote deeper level of text comprehension than no glosses condition.

In support for a study that compared the difference in efficacy between dynamic video and still picture in aiding vocabulary acquisition, Al-Seghayer (2001) claimed that all the studies included in the review of the literature support the use of multimedia to enhance L2 vocabulary acquisition by justifying that the presentation environment, while being a single one, is both interactive and contains diverse instructional resources with printed texts, photographs, slides, dynamic audio, and dynamic video. Additionally, the immediacy of access and student independence as well as the verbal and visual dual coding of information makes the learning activities engaging, enjoyable, more efficient

and effective. According to Al-Seghayer (2001), multiple studies demonstrate that both dynamic video and still pictures are more effective than instructional modes that lack imagery. He makes a strong case for the use of multimedia annotations and adds that it is important that selected pictures and video segments are presented as simple illustrations, they depict meanings precisely and do not contain too much information. Al-Seghayer (2001) was designed to investigate the effects of different types of annotations on vocabulary acquisition on the macro scale, and to compare the efficacy of printed text definition coupled with still pictures as opposed to video on the micro scale.

Thirty intermediate ESL students of a variety of backgrounds enrolled at the university level participated in this within-subject design experimental study. The students were selected with regard to their proficiency level and duration of study of English in the US. The subjects were introduced to a hypermedia-learning program for reading comprehension in three experimental and one control conditions. The three experimental conditions were: printed text definition alone; printed text definition coupled with still pictures, and printed text definition coupled with video clips. All the participants were exposed to all the treatment conditions and every one was his or her own control subject.

The students were presented with an interactive multimedia computer program designed to enhance L2 vocabulary acquisition by providing hyperlinked text, graphic, video and audio annotations. The selected target words for the video clips, pictures, and text were controlled for their grammatical categories and frequency. The users read a

1,300-word narrative text by Mundahl (1993), the target words' printed textual definition, listened to their pronunciations, viewed their meanings via still pictures or video. Additionally, the participants responded to a face-to-face interview and filled out questionnaires. Recognition and production were tested through vocabulary MCQ recognition test and a production test in which the subjects supplied definitions to the selected words.

The results showed that the video and text combination yielded the best results (87% of correct responses, with a mean of 6.1 words, and a $SD = .759$), followed by the Picture and Text condition (67%; 4.7 words; $SD = .952$), and the Text only condition (53%; 4.03 words; $SD=1.586$). Al-Seghayer (2001) concluded that a video clip is more effective in teaching unknown vocabulary words than a still picture, that video better builds a mental image, creates curiosity leading to increased concentration, and embodies an advantageous combination of modalities.

Jordan and Sanchez (1994) investigated the capacity of short video clips in enhancing students' ability to learn and retain information about some basic concepts in American government. The participants were a homogeneous group of 117 freshmen in an introductory American government class at the United States Air Force Academy. They were divided into six (sections) groups based on a strict alphabetic order. Each participating instructor had three sections of approximately 19 participants. In each instructor's group two sections were labeled "treatment" or "video" sections and a control group labeled "traditional." There were 79 participants in the treatment or video groups

and 38 in the control groups. The study had a pretest/posttest experimental design. The posttests were three examinations given during the course and in which multiple choice questions were integrated. All the participants took a pretest in which the video and tradition groups performed indistinguishably. The video groups received many of the treatments through video and the control groups received their treatment in lecture and discussion forms and films sometimes. The researchers hypothesized that the video groups would perform better than the other groups especially on the questions labeled video question. The results of the first test show that there was no difference in performance on the questions that had no video augmentation as well as on those augmented with video. They also found that the students in the video sections on average scored 9.3 percentage points higher than those in the traditional groups, with a significance level of 99.8%. On the second exam, the video section students scores .5 higher than the traditional students on the video questions. Finally, the results of the third exam showed that the video students scored 3.1 percentage points higher than the traditional students on the video questions with a significance of 95%. They concluded that video augmentation may not be helpful in enhancing student understanding but they also gave a word of caution in relation to the video quality and sample size.

What can be said about this study is that in fact there is gain with increasing points apparent in the results that the authors describe as statistically insignificant. However, the increase in difference in gain of 2.6 percentage points between the second exam and the third and last one can be described as a higher level of performance. If the authors appear to be cautious, that may be linked to the design and material quality. Another

lacking in the study may be that retention was included in the hypothesis but was not expressly assessed.

Finally, this finding conforms to Ariew and Ercetin (2004) who voiced a word of caution about dynamic video saying that dynamic video might constitute distraction to the learner and may not help retention.

2. 8 CALL and Text Comprehension

Comprehension, the integration of new information into old information, is defined by Sadoski and Paivio (2001) as an incremental matter of abstracting and combining features or narrowing down an interpretation by excluding elements that are not very appropriate to a situation. Comprehension extends from gradual-superficial to deeper and complete. For Nassaji (2007), comprehension is built in a connectionist way and in multileveled information processing system. He supports that mental representations of texts are made at many different levels ranging from a letter, a word, and syntactic level, to thematic and discourse levels. Nassaji (2007) further adds that “these levels are activated textually, leading to information built up through reciprocal interactions occurring both within and between levels” (p. 92).

In order to deal with comprehension breakdown, readers and listeners attempt mental semantic mapping to understand the meaning of an item in a text chain. This mental activity is triggered by the degree of saliency it presents, as supported by the Gradual Saliency Theory, and the function of the word in the particular instance of use at hand. In such situations, rich contexts can provide interpretations for sentences and the

interpretations, in turn, can facilitate the processing of new meanings and facilitation of memory processes. Memory inherent serves at all levels of comprehension at diverse degrees. Meaning or comprehension cannot be achieved without the implication of short-term memory or working memory for wordings, semantic and episodic memory for interpretations, and long-term memory for longer retention. Comprehension constitutes the first step toward retention. It serves retention as short-term memory serves long-term memory. Only can comprehended language be well retained. For this reason, glosses can be used to ease and enhance comprehension.

A threshold of vocabulary level below which the reader will be handicapped by a lack of comprehension and above which the reader will be able to apply his or her reading strategies to help comprehension and achieve better results is confirmed by Qian (1999), while Laufer (1996) supports that a threshold of 95% lexical coverage of a text is needed for a minimum comprehension. Qian (1999) investigated the correlation between vocabulary size, depth of vocabulary, and reading comprehension, as well as the extent to which depth of vocabulary knowledge adds to the prediction made about reading comprehension scores in relation to vocabulary size. The participants were 74 male and female Korean and Chinese ESL students in an intensive academic program in two universities in Ontario with a threshold level of reading vocabulary of at least 3,000 word families. Those students who did not score at least 13 points at the 3,000-word level were eliminated from the project.

The instruments were four language tests and a questionnaire on the participants' background. Data were collected through pencil and paper assessment. The participants' vocabulary size was measured with six test items for each level. The subjects had to match words with definitions. Each correct choice was awarded one point out of a grand total of 90 points. Reading comprehension was assessed with a modified version of the pencil-and-paper TOEFL (1987) test. Each correct answer was awarded one point out of a total score of 20 points. Breadth and depth of vocabulary knowledge was assessed with a recent version of the Depth of Vocabulary Knowledge Test (Read, 1995) that measured meaning and collocation or the paradigmatic and syntagmatic relationships of words. The test had 40 items with 4 correct answers each, and each correct answer was awarded 1 point out of a total of 160. Morphological knowledge was assessed with Qian's own 10-item test containing words to define, either in L1 or in English. The 10 stimulus words also included affixes.

Inter-rater reliability was controlled. The treatment was administered only once. The Reading Comprehension scores (RC) were the dependent variable and those of Vocabulary Size (VS), Depth of Vocabulary Knowledge (DVK) and Morphological Knowledge (MK) were the independent variables. The results indicate that the scores of the RC, VS, DVK, and MK tests highly and positively intercorrelate. He also found that learners' scores on the depth and breadth dimension of vocabulary are closely related and positively associated and that depth of vocabulary knowledge added 11% of explained variance in reading comprehension over and above the prediction already afforded by vocabulary size. The results support that both meaning and collocation play a

fundamental role in the relationship between vocabulary knowledge and reading comprehension. The researcher concluded that depth of vocabulary knowledge has the ability to make significant and unique contribution to predicting reading comprehension levels. The 3000-word level ESL learners' depth of vocabulary knowledge is an important factor in the relation between vocabulary knowledge and academic reading comprehension.

2. 8. 1 Comprehension.

Comprehension, along with the working memory, is the first step into memory. It cannot be easily dissociated from the notions of schema, salience, and context, as these contribute to its shaping. The understanding of text comprehension is supported by multiple theories among which are the Schema Theory (Rumelhart, 1980), the Graded Salience Theory of Comprehension (Giora, 1997), and the Construction-Integration mode of Reading Comprehension (Kintsch, 1998).

According to Schema Theory, learning is the organization and storage of knowledge structures where schemata are recognition devices that help to achieve the process of evaluation of their fit to the data that is being processed. Schema Theory is the representation and restructuring of ideas in the learner's schematic memory as a network of interrelated concepts, involving both bottom-up and top-down processes. This representation and restructuring of ideas enables readers to comprehend the global as well as local meaning of text at hand.

The Graded Salience Theory of Comprehension supports a view that the ease of comprehension is controlled by how salient the referent of the target item is, and salience depends on factors such as supportiveness of preceding sentence context and/or familiarity with the meaning and how it is constructed. This connection can establish the integration of the new lexical knowledge into the learners existing schemata through the mediation of salience on the target words and the enhancement provided through a learning aid such as hyperlink. The present study focuses on highlighting of the target words and the glosses they have received in order to make them accessible to the reader. The Graded Salience Theory of Comprehension was originally in connection with for metaphor comprehension but can also apply to vocabulary comprehension as it focuses on salience, context, and familiarity with the theme, as metaphor itself is a game of lexis that is specified to a given context, and the context will obviously favor comprehension.

As for Kintsch' s (1998) Construction-Integration Model of Reading

Comprehension, when and if the elements that enter into the process achieve a stable state in which the majority of the elements are meaningfully related to each other and other elements that do not fit the pattern of the majority are suppressed, comprehension occurs. Thus, comprehension is a measure of fitness of an item into a given context, and this fitness can be a prelude to retention and automaticity. In light of this theory, it can be said that in reading texts and extras, the lexis used is set for a specific meaning but, in reading comprehension, the reader may not only take a word or expression with the meaning intended by the writer but may also assign a different meaning to the word or expression. This possibility of polysemy is both an asset and a liability, depending on

how the reader engages the text or what his or her proficiency level is. It is an asset in the sense that it allows the reader not only to employ a bottom-up reading strategy using the actual words of the text as a means of making sense of the text, but the reader can also use a top-down reading strategy, bringing his or her knowledge of the world into the interaction with the text in order to make sense out of it.

2. 9 Vocabulary Retention

2. 9. 1 Vocabulary learning principles.

According to Schmitt and Schmitt (1995), the best way to remember words is to incorporate them into language that is known. Schmitt and Schmitt (1995) support that if words are integrated into a rich network of interwoven association, those associations can facilitate the recall of these words and that meaning-focused introduction of vocabulary items can solve the word pair confusion.

The deeper the mental processing used when learning a word, the more likely it will be remembered as supported by Craik and Lockhart (1972) and Craik and Tulving (1975). Schmitt and Schmitt (1995) add that deeper, richer semantic processing such as creating a mental image of a word's meaning, judging the formality of a word, or grouping the word with other conceptually associated words will be more likely to enhance learning than shallower processing such as rote repetition. Additionally the use of target words in sentences will improve chances of future recall. This strategy is in line with Cohen's (1990) argument according to which efficient learning happens when learners are concentrating their mental resources on the task at hand. Words need to be

recycled in order to be learnt as suggested by Nation's (1990) review of empirical studies that establish between 5 to 16 exposures to guarantee retention of new words, and the necessity of recycling to avoid forgetting partially learned words.

A study entitled *Input, Intake, and Retention* by Watanabe (1997) investigated whether and how input modification by way of inserting vocabulary explanations affects incidental learning of foreign language vocabulary through reading. Two hundred thirty-one native speakers of Japanese in four universities participated in this experimental study. The researcher used a pretest, immediate posttest and delayed posttest design. The material consisted of ten different versions of the target text with added translation tasks for each of them. The first one was presented in its original form, the second with appositives, the third with glosses, the fourth with Multiple-choice glosses, the fifth as a control text, and a copy of each of all five of them without translation tasks. There were 16 target words presented with their explanations and adjoined distracters. The target words in the original text condition were only underlined for enhancement. Five open-ended questions were prepared for each text. The study was conducted during two regular 90-minute class sessions. In the first session, 10 versions of the test were randomly distributed at each class. Time was allocated to the four sections given to each student as follows: 20 minutes for the first section (vocabulary pretest and questionnaires), 25 minutes for the second section (treatment), 20 minutes for the third (proficiency test), and 10 minutes for the fourth session (vocabulary posttest).

The first section of the booklet had three subsections. The pretest asked the students to write the meaning of the word in the right margin in Japanese. There were in

all 32 target words consisting of 16 from the treatment group and 16 from the control text target words. The second section was a 30-item Likert-scale about the students' topical knowledge. The subjects were instructed to indicate the degree of their knowledge by circling one of the seven options of the items. The third subsection consisted of a questionnaire about biographical information.

The second section served as treatment, with the subjects reading one of ten text versions. Five of the groups who received the text with underlined target words were instructed to write the meaning of the 16 target words in Japanese and answer the five open-ended comprehension questions. Those subjects whose target words were not underlined only received the comprehension questions. The third section of the task consisted of the cloze test that measured the students' English proficiency and kept them equally longer on the reading task. The test had 25 blanks, one in lieu of every seventh word deleted. Thirty words were provided as candidates to fill the gaps. The posttest was administered as the final section of the first session. Then two delayed posttests were given to the students with the second one intended to measure the recall of acquired vocabulary knowledge when local and global clues were provided and the context for the recall was compatible with that of learning. The test scores and questionnaire responses were analyzed. The results showed that there were significant differences between the two delayed posttests $F(1, 226) = 569.12, p < .0001$ among the five modification types, $F(4, 226) = 15.27, p < .0001$, and in the interaction between the two tests and the modifications, $F(4, 226) = 10.80, p < .0001$. The students in the treatment group were able to understand the passage fairly well, and the gloss group scored significantly better on

the comprehension test than the original group. Additionally, the gloss and multiple choice gloss conditions' scores were significantly higher than either the original or the appositive conditions. Watanabe (1997) concluded that incidental learning of vocabulary through reading is a gradual process and that even with facilitative devices such as marginal glosses, unless students are exposed to the target words repeatedly, substantial learning cannot be expected. But the contrary will be true if modified reading materials are used in combination with exercises containing contextual clues.

Groot (2000) used his CAVOCA (Computer Assisted VOCabulary Acquisition) program for vocabulary acquisition based on the theories of natural (L1) word acquisition process in which several stages may be recognized, and that supports that learning a word is an incremental process that gradually develops with repeated exposure. Groot (2000) investigated long-term retention of vocabulary using two different methods. The study was a summary of four other experiments done as Masters Theses. That used the CAVOCA program. He focused on the selection of relevant vocabulary items and the creation of optimal conditions for the acquisition process (also see Nation, 1990). These experiments had a quasi-experimental, pre-test/post-test, differential treatment design, with the learning method as the independent variable and the scores on the post-tests as the dependent variables. University and secondary school students aged between 16 and 20 years old participated in the study. The subjects were randomly assigned to the experimental and the control groups with each a different word list. The experimental (CAVOCA) and the control condition (bilingual lists) were compared in four unpublished

experiments done as master theses. A pretest was administered to check prior knowledge and prior familiarity with the target words. The effect of the two methods was measured twice: immediately after the session and two to three weeks later to determine the long-term retention effect. The subjects had not been told about the delayed test to prevent the subjects from paying more than usual attention to the words after the learning session. Due to the relatively low frequency of the target words, the chances that the subjects would come across the test words during the period between the immediate and the delayed tests were slim. As a result, the words already familiar to the learners were not used in the experiment. It was found that exposure to words in context is preferable to exposure to words in isolation as the context provides support to the establishment of links between the word and the learners' background knowledge, as well as between the word and its environment of use. Only contexts will fully demonstrate the semantic, syntactic, and collocation features of a word that the learner has to process in order to establish the numerous links and associations with other words necessary for later easy accessibility and retrieval. Another implication, although more controversial than the first, appears to be that having learners infer the meaning of new words from the context is a better way to safeguard and elaborate intensive processing than giving the meaning, because of the greater cognitive effort required. The results showed that the control group scored higher than the experimental group, but the experimental group retained the meaning of the newly learned words longer.

2. 9. 2 The role of attention in learning vocabulary.

Robinson (1996) defines attention as the mental effort involved in processing information. Attention commands the capacity of performance of a subject that can increase or decrease in relation to the constraint performance receives when the number of task dimensions or components to be processed increases or decreases. The concept of attention is attached to three notions: the selection of the information to be processed and memorized, the monitoring of the capacity to process information, and the deployment of the mental effort needed in processing given information. A summary of the theoretical discussion by Robinson (1995, 1996) focuses on major points in the study of second language including the role of consciousness on the form of input at the level of “noticing,” consciousness-raising, input enhancement, and focus on form that determine the conditions and levels of success in learning L2 vocabulary. For example, when a learning activity appeals to the consciousness of a learner and when a learner notices the gap in his knowledge in relation to a given activity, his level of consciousness will increase. Consequently, this increase will create a level of determination to solve the problem and a predisposition to internalize the new knowledge. If the new material is enhanced with some sort of help and the learner’s attention is focused on the problem elements in the activity, acquisition of the new knowledge will be more likely to occur than when there is no enhancement and the learner’s attention is not focused. This stimulation of consciousness aims at directing the learner’s attention to problematic aspects in the input in order to promote their acquisition.

For Nagle and Sanders (1986), when appropriate automatic processes are not available or are not activated in a given comprehension task, the next primary source available to the individual will be attention. Attention increases mental activity in the nervous system. These processes work in both implicit and explicit learning, each with its specific characteristics either for comprehension or retention.

2. 9. 3 Deep processing and retention.

Retention, the process whereby a representation of past experience is elicited is a function of memory that can be defined as including a more complex function and having distinct phases of memorizing or learning, retention, recall, and recognition. This development can be described as evolving from noticing, intake, and storage in the short-term memory and later in the long-term memory (the more permanent one) and to start with an intake, input is needed.

Through ten experiments, Craik and Tulving (1975) further explored Craik and Lockhart's (1972) levels of processing framework whose basic notions are that the episodic memory trace may be thought of as a rather automatic by-product of activities carried out by the cognitive system and that the durability of the trace is a positive function of greater degrees of involvement called "depth" of processing. The participants to the different experiments were induced to process words at different levels of depths by answering various questions about typescript. Two types of questions were used to take the subjects' processing to a variety of levels: intermediate levels of encoding were accomplished by asking questions about rhymes, and deep levels were induced by asking

whether the word would fit into a given category or sentence frame. Later, the subjects were unexpectedly given a recall or recognition test for the words. In general, the higher levels of performance on these subsequent memory tasks were associated to those participants who took longer and processed their answers to the encoding questions at a deeper level. Also, questions leading to positive responses were associated with higher retention levels than questions leading to negative responses, at least at deeper levels of encoding. After a greater and detailed analytic examination of this pattern of effect in the experiments, it was established that elaboration or “spread” of encoding provides a better description of the results. It was also found that retention depends critically on the qualitative nature of the encoding operations performed. A minimal semantic analysis is more beneficial than an extensive structural analysis. Memory performance is enhanced to the extent that the context, or encoding question, forms an integrated unit with the word that is presented. A congruous encoding yields superior memory performance because a more elaborate trace is laid down and because in such cases, the structure of semantic memory can be utilized more effectively to facilitate retrieval. The Levels of Processing Framework is thus a valid basis for memory processes.

2. 9. 4 Retention.

Retention, one of the most important objectives of vocabulary learning, can be aided when the object of the learning is enhanced. Besides this saliency, theory suggests that information is stored in memory based on the Levels-of-Processing as in Craik and Lockhart’s (1972) Levels of Processing Model. In their view, the way the information is

handled can determine its being committed into memory. The Information Processing Model focuses on how information is stored in memory and retrieved. According to Craik and Lockhart (1972), learners utilize different levels of elaboration as they process information. For Craik and Tulving (1975), retention critically depends on the qualitative nature of the operation of encoding that is performed. Additionally, they suggest that a minimal semantic analysis is more beneficial than an extensive structural analysis. The authors contend that a congruous environment yields superior memory performance because a more elaborate trace is laid down, and the structure of semantic memory can be utilized more effectively to facilitate retrieval of the stored information when needed.

According to Huitt (2003), organization and repetition are the two major concepts for retaining information in short-term memory, and this teaching intervention study focuses on the option of organization, managing input in a way that is different from the traditional mode and provides help embedded into the input through hyperlinks. It gives the learner the independence of choosing when and what information to request under which condition as he or she uses the computer. The findings reported by Huitt's (2003) are relevant to the present study as they offer the possibility for examining what information can be retained and for how long by assessing both medium-term and long-term retention. The study incorporates information that is relevant to declarative memory as vocabulary mainly consists of every type of information: concrete and abstract. According to McLaughlin et al.'s (1986, 1987, 1990) and McLaughlin and Heredia's (1996) views of Information Processing Theory, learning evolves from controlled to automatic processing, and from an explicitly taught or learned condition at the initial

stages, to implicit learning with relatively passive apprehension of linguistic structures, focusing on meaning, applying the top-down and bottom-up processes in reading. Paribakht and Wesche (1997) and Zimmermann (1997), for example, maintain that reading for meaning results in significant acquisition of L2 vocabulary, but when reinforced with direct and systematic vocabulary instruction, it is a more successful approach and leads to even greater number of words as well as more depth of knowledge than simply learning through context alone. The comparison implicit and explicit teaching of vocabulary represents the core of the study. The application of information processing theory involves practice of what is being internalized by constantly restructuring one's linguistic system, and the implicit and explicit acquisition of vocabulary can be affected by the use of a computer-assisted hypertext reading task.

2. 10 Motivation and Foreign/Second Language Learning

Second language learning is regulated by a combination of internal and external individual factors. In second language acquisition, motivation is one of the main determinants of success (Gardner, 1985). It allows the predisposition of the mind and body to engage into accepting, interacting, and producing strings of new knowledge and language-related social behavior. In motivation theory, the key terms *intrinsic*, *extrinsic*, *instrumental* and *integrative* define the conditions. Intrinsic motivation is internally initiated. It is about an individual's own decision to do something. Extrinsic motivation is related to the desire to do something under the influence of external sources. Instrumental motivation is related to the individual's expectation to receive valued reward or outcome

for executing an activity. Integrative motivation is created by the desire and effort to be an integral part of the target language community. Integrative motivation is more related to L2 learners but only very superficially to foreign language learners. According to Gardner and MacIntyre (1994), various reasons for studying L2 have been classified as reflecting integrative or instrumental orientation and generally, the instrumental aspect applies to less proficient subjects such as intermediate-level learners and the integrative level applies to more proficient level learners. The application of the continuum of intrinsic, extrinsic motivation can be helpful in systematically organizing language learning goals as well as in analyzing the classroom climate and L2 teaching in terms of how much they promote either autonomy or control. Equally important is motivation stemming from the task to be performed by the learner. In the case of Computer Assisted Language Learning activities, it is essential that whatever level of interest a task has, it needs to be presented in a way that appeals to the learner so that he or she can fully engage in it. As for the teaching of vocabulary, the input needs to be perceived as useful, important, and even necessary for instrumental and intrinsic use, challenging but not inaccessible. These principles can be applied for educating autonomous self-regulated L2 learners.

Motivation was earlier considered as a stable condition of the learner such as the learner's social perception of the L2 and its speakers, generalized attitudes toward the L2 learning situation, and the interethnic contact and the resulting degree of self-confidence. Dornyei (2001) points out that nowadays, the concept is extended to include cognitive and situation-specific variables and it is viewed as "a more dynamic factor that is in a

continuous process of evolution and change according to the various internal and external influences the learner is exposed to” (p. 44). Motivation is generally and traditionally measured by versions of the standardized Attitude/Motivation Test Battery developed by Robert Gardner’s social-psychologist research group at the University of Western Ontario in Canada, but nowadays, it is analyzed more qualitatively with multidirectionally oriented results. But there are different levels and kinds of motivational factors that consequently affect learning in somewhat different ways. Among the different forms are the social motivation stemming from the sociocultural environment; the process-oriented motivation based on developmental aspects of learning; motivation-based on internal factors; self-determination factors with distinction. Motivation is the relative predisposition to do something that can be internally effected or externally imposed, and socially constructed. This is how it is related to the level of performance in carrying out an activity and can affect, less physical constraints, the degree of success or failure in doing an activity.

Integrative motivation is not taken into consideration in the present study as it is more related to the integration of the learner into the L2 society while the subjects in this study are learning a foreign language, away from the target culture. Because of the specificity of the subjects and the learning environment, the present study focuses on intrinsic and extrinsic motivation, very closely related to foreign language learning (Oxford & Shearin, 1994).

There is a difference between instrumentally oriented motivation and externally regulated motivation that in fact are definitionally similar. Both constructs emphasize the

execution of an activity as a reaction to some object external to the individual and the activity itself. The relations between intrinsic motivation and extrinsic motivation and the other three orientations, however, are less obvious. For example, travel, knowledge, and friendship orientations could be considered extrinsically motivated goals, in the sense that they refer to reasons extrinsic to language learning itself.

Intrinsic motivation is defined by Noels et al. (2000) as the motivation to engage in an activity because that activity is enjoyable and satisfying to do. It is founded upon innate needs for competence and self-determination.

Extrinsic motivation is behavior that mediates the actions carried out to achieve some instrumental end, such as earning a reward or avoiding punishment. However, it does not necessarily imply a lack of self-determination. Extrinsic motivation is however situated on a continuum that extends from the lowest to the highest levels of self-determination that correspond to external regulation, and internally determined by sources external to the person, introjected regulation that derive from external sources, but is integrated by the person, and identified regulation as the most self-determined extrinsic motivation. According to Noels et al.'s (2000) theory, apart from the intrinsic and extrinsic motivation, there also is one that refers to the situation in which people see no relation between their actions and the consequences, just as arising from factors beyond their control. They describe their theory as having “an advantage over empirically derived orientation frameworks in that it provides psychological mechanisms — self-determination and perceived competence — that can explain and predict how orientations are related to learning outcomes” (p. 41).

2. 11 Summary

This chapter presented the review of the literature on the relationship between reading and vocabulary acquisition, the relationship between deep processing and retention, and between gloss type and retention, and the relationship between motivation and vocabulary learning. Both the empirical and descriptive studies presented in this chapter provide important information in the sense that not all of them agree on the different points under discussion, but each of them made a point in a way that can influence future pedagogical decisions. Reading is obviously one of the most important sources of second language vocabulary acquisition but is constrained in many ways, depending on the level of the reader, the text type, and the mode of instruction, the overall materials used and also the level of motivation of the reader. In terms of instruction, a combination of implicit as well as explicit modes of teaching and learning and learning strategies has been the most favored. With regards to maximizing the input and maintaining a good level of authenticity, as well as favoring the autonomy of the learner, the use of technology at all level and in all possible contexts is more than encouraged by the in the literature. It is, however, advised by some to caution about the kind of help to provide the learner with, for the simple fact that not all enhancements work the same way, have the same or benefit for all the students. The choice for each will depend on each context the kind of individuals involved. For a better level of retention, many studies have recommended the situations in which deeper processing of the information can be effected, thus calling into the use of specific strategies both in teaching and in learning. For better success, it is implicitly recommended to work for sound pedagogical theories,

appropriately designed materials and a teaching and learning well catered for and centered around the learner in order to provide him with the necessary independence, materials, and strategy that he can use as needed, without being overwhelmed or lacking help when needed. This mediation will be a critical role that Computer-Assisted Language Learning can play if all the actors invest the necessary means and efforts.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The review of the relevant literature in the previous chapter provides the theoretical foundations to this study. The present chapter provides a detailed description of the methodology. It defines the research questions and provides operational definitions of the different constructs under investigation. The relationship between vocabulary acquisition and reading comprehension in Computer-Assisted Language Learning environments is considered to be beneficial to the learner, they facilitate isolated word learning and provide vocabulary assistance during text reading (Kim and Kamil, 2001) and provide immediate access to textual, auditory, and visual annotations that are described as less intrusive than looking up words in a dictionary (Martinez-Lage, 1997). Multimedia presentation can improve comprehension and retention of information. It is also supported that deep mental efforts help memory performance (Paivio, 1971; 1981; Baddeley, 1991) and help vocabulary retention (Hulstijn, 1996). Additionally, it has been demonstrated that giving explicit instructions and additional enhancements, helps learners to better concentrate on an assigned activity and better achieve production as well as subsequent recognition of encountered vocabulary. However, Ariew and Ercetin (2004) caution that its efficacy can be questioned as dynamic image proved to be rather distractive of the processing. The presentation of information with the computer (CALL) constitutes a basis from which the learner can navigates between diverse aspects of input, and the monitoring of these forms of information constitutes a substantial mental effort on the part of the learner. In first language learning, it has been established that most of

the vocabulary that people gain is acquired implicitly through extensive reading (Krashen, 1989; Cho and Krashen 1994; Dupuy and Krashen, 1993). For Zahar et al., (2001), it is reasonable to argue that some form of explicit instruction is important in learning vocabulary, suggesting that acquisition through reading be supplemented by either direct vocabulary instruction or instructionally enhanced reading. Both implicit and explicit instruction in vocabulary leads to some level of acquisition as supported by Hunt and Beglar (2005). A question, however, remains as to which of the two modes will lead to longer term retention.

The present study mainly investigates the difference in outcome between implicit and explicit modes of teaching second language vocabulary in Computer-Assisted Language Learning environments in general, as well as in relation to the specific demographic variables, namely an intermediate level of French as a foreign language at the university level. Computer-Assisted Language Learning (CALL) refers to the use of the computer as a tool for engaging into the teaching and learning of a language. It is an alternative to the traditional paper text and is hailed as very beneficial by many researchers (Chapel 1998; Kim and Kamil, 2001; Warschauer, 1998). In CALL, the computer serves to convey and receive information and is a ground for producing and practicing the target language at one's own pace and command. Liao (1999) notes that in hypermedia, the strategies employed are advantageous to students because the learner is in charge and can use a variety of media to approach the subject. Thus, the students have the ability to select or ignore any of the options they are presented with. In the present project, the computer is used both as a means of reception, a tool for responding, and as a

determiner of the learning situation. The use of the computer aims at facilitating the acquisition of vocabulary. Comprehension, the second variable of interest in this study, is not prompted with guiding questions – as this may confound the result (Barnet, 1988) – but solely based on the personally initiated interaction of the reader with the enhanced text. In order to guide the study, three research questions are formulated and detailed in the next section.

3.2 Research questions

The present study asks three main questions:

- 1) What is the effect of implicit and explicit teaching of vocabulary on comprehension?
 - a) What is the effect of implicit teaching of vocabulary on text comprehension?
 - b) What is the effect of explicit teaching of vocabulary on text comprehension?

- 2) What is the effect of implicit and explicit teaching on retention?
 - a) What is the effect of implicit teaching on immediate retention?
 - b) What is the effect of explicit teaching on immediate retention?
 - c) What is the effect on implicit teaching on delayed retention?
 - d) What is the effect of explicit teaching on delayed retention?

- 3) What is the effect of learner motivation on text comprehension and vocabulary retention in implicit and explicit teaching of vocabulary?

3.2.1 Research question 1.

What is the effect of implicit and explicit teaching of vocabulary on comprehension?

Research question number one specifically aims at investigating the difference in the level of comprehension of the narrative text between the implicit and explicit group members in the computer-assisted language learning environment. In the implicit learning condition the vocabulary learning objective was not explicitly stated. While the target vocabulary items were highlighted and hyperlinked to additional help, the highlighting disappeared at first mouse click whenever a subject accessed a target word. In the explicit condition, the vocabulary learning objective of the activity was explicitly stated, and the novel items were permanently highlighted and hyperlinked to the same additional help available to the implicit group, while the explicit group subjects had to click on every single target item before moving to the post-reading activity.

3.2.2 Research question 2.

What is the effect of implicit and explicit teaching on retention?

In the present study, retention is defined as the storage of new information beyond working memory into long-term memory. Immediate retention it refers to the retention and storage of the new vocabulary items as assessed immediately at the end of the treatment and evidenced by the short-term retention of the new vocabulary items. The phrase “delayed retention” is used in lieu of long-term retention of the target words, and

the term “delayed” refers to the second assessment of the vocabulary retention as measured not immediately after the treatment, but rather three and a half weeks later.

It is understood that vocabulary retention is a critical aspect of language learning (Lewis, 1993, 1997; Nation, 1990). If a learner does not retain learned material, he or she will have to restart the learning cycle over and over again every time that there is need to use a given language item. In an attempt to avoid the repetition of the act of learning vocabulary items, efforts are needed to explore ways of teaching and learning vocabulary that can improve immediate retention of new items and lead to durable long-term retention. In order to investigate how effective and how long the retention of vocabulary acquired under these specific conditions is, research question number two is specified in four different ways. In the two first parts, the question attempts to investigate how the implicit and explicit teaching of vocabulary with electronically enhanced items hyperlinked to additional information affects the level of retention when a vocabulary test is given to the learner immediately after the treatment. In its last two parts, research question number two focuses on how the implicit and explicit teaching of vocabulary with electronically enhanced items affect retention of the new vocabulary at the end of a period of three and a half weeks.

3.2.3 Research question 3.

What are the effect of a learner’s motivation on text comprehension and vocabulary retention in an implicit and an explicit teaching of vocabulary with a hypertext reading task?

Research question number three investigates the effect of motivation on personal characteristics of the learners such as motivation. As formulated in the hypotheses presented below, it is expected that the type of motivation will tend to affect the subjects' performance in some way as may appear in the recall protocol for comprehension and the two vocabulary tests, namely the immediate retention and the delayed retention tests. In order to observe the relationship between the learner's background, narrative comprehension and vocabulary retention, the question examines the relationship between type of motivation and text comprehension, immediate and delayed retention as well as an interaction between more than two of the named variables.

3.3 Hypotheses

With regards to the different types of treatment and the different characteristics of the subjects, it is hypothesized that their levels of performance on the different tests will not be exactly the same, and two hypotheses have been made as detailed below.

3.3.1 – Hypothesis 1.

The implicit and the explicit group members will differ in their respective levels of comprehension of the narrative, in the size of vocabulary they learn, and in the durability of their vocabulary retention. Additionally, their levels of motivation will affect the way they learn and retain new vocabulary, as well as the way they comprehend narrative texts. In light of the different ideas gathered in the literature review, the following hypotheses are made:

- a) Teaching vocabulary implicitly with an enhanced electronic reading text in which the target words are hyperlinked to additional information that is accessible as needed and when the highlighting on the target words disappears at first mouse click will constrain the reader to make more effort and process the information in more depth in order to better understand the unknown items (Scott, 1989). This additional effort may not help them to acquire a large number of new items when the expressed objective of the activity is to understand the content of the text, not the individual words (Sweller, 1999). By contrast, however, the focus of attention on the selected items will help them retain their acquisitions more durably (Herman, 2003). As Laufer and Hulstijn (2001) also posit, the retention of unknown vocabulary words depends on the degree of involvement in processing the words. Thus, the readers in this condition will tend to have moderate gain of new vocabulary but more durable retention.
- b) Teaching vocabulary explicitly with an enhanced electronic reading text in which the target words are permanently highlighted and hyperlinked to additional information that is accessible whenever it is needed as well as the necessity to check on every single target item will make it easier to comprehend many more new items than in the implicit condition. Additionally, because of the saliency of the target words (Rott, 1999) and the overt statement of the vocabulary learning objective of the activity, the readers in the explicit condition will learn more vocabulary items (Watanabe, 1999), but many of these newly “acquired” words

and expressions will be more likely to slip out of memory. The explicit group members will gain more vocabulary items immediately (Paribakht and Wesche, 1997; Zimmermann, 1997) but will retain only moderately if retention is not linked to deep processing, intense mental effort, and deeper involvement into the activity. In the event that only limited mental efforts are allocated to the learning of the new items and the information is processed in a limited way (Laufer and Hulstijn, 2001; Hulstijn, 1996) retention will not be durable enough. When the explicit group members take the delayed vocabulary posttest for a second time at the end of the three and a half weeks after the reading activity, they will proportionately recall fewer vocabulary items than will the implicit group members.

3.3.2 – Hypothesis 2.

The types of motivations of the subjects will tend to affect their levels of performance in some way (Dornyei, 2003). The subjects whose reported motivation matched the criteria of instrumental motivation for learning a foreign language at least at that time of assessment will tend to comprehend better and retain more and longer than those who learn the foreign language primarily as a requirement (Gardner, 1985).

- a) The subjects whose motivation to learn French can be described as personal — at least at the time of the task — will achieve relatively better results.
- b) The subjects who take the French course only to fulfill a requirement will tend to perform not as well as those who like to learn French.

3. 4 Research Design

The study has two experimental groups and does not have a control group. It has a posttest-only randomized design (Patten 2002) with between-subject and within-subject analysis. It has an immediate and delayed posttest but not a pretest. The study explores and describes the performance in vocabulary learning and text comprehension of intermediate learners of French in a Computer-Assisted Language Learning environment at the university level. There are two experimental conditions and a demographic consideration. This design is appropriate to compare two slightly different modes of instruction using the same content and measuring the outcome with the same tools. The study finally discusses the quantitative results of the participants but also briefly expands to examine some qualitative aspects of interest.

3.4.1 Experimental conditions.

Hunt and Beglar (2005) suggest a framework for teaching vocabulary in two modes, implicit and explicit as based on teaching strategy for vocabulary training. According to the framework, explicit teaching focuses on the study of decontextualized lexis for acquiring, consolidating, and elaborating vocabulary, using dictionaries and inferring meaning from context. Implicit teaching relies on reading that focuses on meaning and engages the development of vocabulary size and fluency. This implicit lexical instruction is reinforced with learning strategies. The condition described as implicit by Hunt and Beglar (2005) is termed as incidental by Hulstijn (1996) who supports that frequency of occurrence and the supply of meaning will foster incidental

vocabulary learning in advanced L2 learners. Definitions of the two conditions are specified below.

3.4.1.1 *The implicit condition.*

In the present study, implicit teaching is defined as the condition in which the real objective of the teaching is not overtly stated but rather expected to occur as a by-product of doing the assigned task. In the implicit condition of this study, the subjects were not aware that the main objective of the activity was vocabulary learning. They were only instructed to read the text for comprehension and that words that might be difficult were highlighted and hyperlinked to additional information that could help them to better understand the narrative, should they need help. The subjects were instructed to read the text for comprehension while in fact they are doing a vocabulary activity on which they were going to be tested, both for immediate and long-term retention. Additionally, whenever a reader clicked once on a highlighted item, the highlighting disappeared and the word became plain as was the case for any of the other word in the narrative. The subjects did NOT have to click on every single highlighted word as in the explicit condition before being able to move to the following screen. The students could, however, if they so choose, proceed to the next page even though they have not clicked on all the target words.

3.4.1.2 *The explicit condition.*

Explicit teaching, on the other hand, is defined as the condition in which the reader is overtly informed about the actual objective of the activity. In this study the subjects were informed that their task was to learn and retain the new and highlighted vocabulary contained in the text. They were overtly informed that the objective of the reading activity is first and foremost to understand and memorize the target vocabulary words. The target words were permanently highlighted in blue, color that did not disappear with a mouse click but only changed whenever a subject clicked on a word to request information that would help to understand the vocabulary item. The target words were hyperlinked to additional information that was accessible to the subjects in the two conditions in the same exact way. Another difference in the explicit condition was that the subjects had to access at least one gloss for every single target word before they could proceed to the next screen. The two conditions, however, had the same list of target words and annotations. If a reader did not click on all the highlighted items, he or she would not be able to proceed to the following screen.

3.4.1.3 *Annotations.*

The annotations used in this study are based on an adaptation of Ruby's (1999) taxonomy of glosses (see Appendix G). They are textual, graphic, and auditory as described below. The target words are hyperlinked to additional information and can be accessed whenever needed (Rott, 1999; Nikolova, 2004). They can be displayed as long as desired by the reader and are reachable at mouse click. Hulstijn and Graaff (1994)

contend that diversifying the modalities of glosses for words with enhancements such as printed text, graphics, video, and sound, may help facilitate vocabulary acquisition and retention. According to Brown (1993), frequency of occurrence affects acquisition of vocabulary, and it does so better when occurrence is modified by context and saliency. In this study, the annotations are highlighted in blue. Following are the details of the textual, graphic, and auditory enhancements:

a) The textual annotations (*English translation*) consist of translations of the lexical units, supplemented with additional explanations in certain cases, a format used in many previous studies (Plass and Jones, 2005; De Ridder, 2002; Hulstijn, 1992; Laufer and Hill, 2000; Chun and Plass, 1996b)

The textual annotations are comprised of English translations of the French words, phrases, sentences, or expressions. They are expected to provide easier and better understanding and facilitate retention of the target items.

b) The graphic annotations are in the forms of graphs and photographs that illustrate the words, lexical units, or notions (Ercetin, 2003; Al-Seghayer, 2001; Yoshii and Flaitz, 2002; Chun and Plass, 1996b; Plass and Jones, 2005; Davis and Lyman-Hager, 1997).

Graphic information may be a picture, chart, or any non-text visual stimulus that represents the meaning of the item or notion, colored or in black and white, presented in a static form. As Ariew and Ercetin (2004) note, video dynamic graphics tend to be disruptive and as Chun and Plass (1996b) also hold, with the countless frame changes, the viewing learner does not have enough processing time.

b) The auditory annotations are auditory representations of the target word, expression, or notion (Ercetin, 2003; Al-Seghayer, 2001).

These forms of annotation are not phonological such as the pronunciation of the words, but rather the acoustical duplication or representation of the items or notions. For example the word “grincer” had the textual annotation of “creek, squeak.....” and its auditory annotation was not its pronunciation but rather how it sounds. The sound of a machine that needs grease was presented to make the word “grincer” easily understandable without any other form of mediation. The choice of these forms instead of pronunciation provided conceptual information that facilitated understanding better than the simple pronunciation of the words, as well as eliminated the possibility that the resulting retention is that of the phonological short-term memory as suggested by Ellis, and Sinclair (1996).

3.4.2 Variables and instrumentation.

In this study, experimental and demographic variables were studied. The experimental variables were related to the treatment offered to the subject. The demographic variables were the characteristics presented by the subjects. The experimental variables were divided into dependent and independent as presented in the following section.

3.4.2.1 *Experimental variables.*

The experimental variables in this study were the implicit and the explicit acquisition of vocabulary with a hypertext reading task, and comprehension of text by the implicit and the explicit group members. The experimental variables were determined by the treatment that characterizes and distinguishes them from the demographic ones. The implicit teaching modality, the explicit teaching modality, and the reading activity were the independent variables, and their outcome of comprehension, immediate retention, and delayed retention were dependent variables. The independent variables were those that do not result from an occurrence but rather produce variation on other conditions or situations. As for the dependent variables, they were affected by independent variables. In short, independent variables were the input variables, and the dependent variables were the output variables.

3.4.2.2 *Independent variables.*

There are two major independent variables that guide this investigation: the controlled implicit and explicit instruction modes of teaching vocabulary with a hypertext reading task. A third one is the reading time that may also affect the level of performance. These variables are used to find out how well learners do on a vocabulary test and on a narrative recall when the objective of the task is explicitly specified, when the learners have to click on each item as opposed to when the objective is implicitly presented and expected to be reached as a by-product of the overt objective, specifically when the learners do not have to click on each target item and when they do, the highlighting

disappears. The other independent variable is the total reading time and how it affects the level of performance on comprehension and retention tests.

3.4.2.3 *Dependent variables.*

The main dependent variables in this study are the levels of performance on the immediate and delayed vocabulary retention tasks and the level of performance on the comprehension task through the recall protocol. All three sets of dependent variables are investigated in relation with the independent variables of implicit and explicit teaching and reading times.

Table 1: Summary of the experimental variables

Experimental variables	
Independent variables	Dependent variables
Implicit teaching	Immediate retention
Explicit teaching	Delayed retention
Reading time	Comprehension

3.4.2.4 *Demographic variables.*

In addition to the experimental variables, motivation, demographic variable, is examined in terms of its effect on performance on the different tests in the two conditions. It is believed that the type of motivation can affect performance in language learning in general and may have an impact on the readers' performance in acquiring

vocabulary as well as in comprehending narratives when instructed in a Computer-Assisted Language Learning environment, either implicitly or explicitly, as specified earlier under the section on the experimental conditions. The demographic variables, in association with the independent variables, are evaluated in terms of how they can shape the dependent variables or not, in association with the independent variables.

3.4.3 Type of Motivation.

The type of motivation refers to how internally, externally, or instrumentally the subject is conditioned to learn. Based on Dornyei (2001), motivation can be broadly classified as intrinsic when the subject is genuinely self-conditioned to learn. It is described as an extrinsic or external constraint when the conditioning is imposed from an external source. When the predisposition to execute an activity is based on a specific type of reward, it is termed as instrumental. Integrative motivation may be marginal in the present study as the language is not learned in the target society or culture. This last aspect of motivation will not be included in the analysis, as learning a foreign language away from its home society does not necessarily aim at integrating the target culture.

Table 2: Summary of the motivation types revealed by the background questionnaire

Intrinsic and instrumental
Intrinsic only
Instrumental only
Requirement

3.5 Subjects

The subjects were 78 male and female intermediate level students of French as a foreign language at The University of Arizona in Tucson. They were all registered in FREN202 classes for the fall semester of 2006. FREN202 is an undergraduate level class equivalent to the fourth semester of college foreign language study. It is also the last level of foreign language required of most undergraduate students to graduate. All of the students at this level were selected as part of the intact classes invited to participate in the study as the treatment was integrated into the syllabus. The subjects had diverse language backgrounds and were taking the intermediate FREN202 course for a variety of reasons. Some of them were taking the class to fulfill the requirements for graduating from the university. Per the policy of The University of Arizona, as in most U.S. colleges, every student needs to take and pass a foreign language class at the intermediate level equivalent to four undergraduate semesters before he or she can graduate. A second group was motivated by the readiness for possible future travel to France or to another French-speaking country, either for recreation or with a professional objective. A third group was taking French either as their major or minor field of study. The different reasons cited above were associated with different types of motivation as revealed by the responses to the background questionnaire.

The level of proficiency among the subjects was not an issue. All of them met the prerequisite to register at the 202 level and were regularly registered in one of the six intact classes. Most of the students had moved gradually and successfully through the normal progression over the semesters to the 202 level, while others took the test for the

College Language Education Placement (CLEP) and were assigned to the level according to their level of performance on the test. The researcher submitted a detailed research proposal to the Institutional Review Board office for human subjects' protection and was granted authorization to invite individual and voluntary participation of students in the project. All the students registered in the six FREN202 classes were invited to participate but only the information of those who granted written permission to use their data for research purposes was included in the project. A total of seventy-eight students gave written permission to use their data for this research study.

The subjects ($N = 78$) were randomly assigned to two treatment groups: an implicit group (IG: $N=39$), and an explicit group (EG, $N=39$). The implicit group received the implicit treatment and the explicit group received the explicit treatment. The detailed demographics of the subjects are presented in table 1 below before the presentation of the materials used in the study.

Table 3: The Subjects

Implicit group		Explicit group		Total N
21 males,	18 females	20 males,	19 females	78

3.6 Materials

This section presents the materials. All the materials were used in two group-specific projectors of the linearly connected units in the Reading Toolbox software

(2003) for vocabulary teaching. Included in the different screens presented in the Reading Toolbox were: an introductory questionnaire on the demographics of the students, a reading text electronically enhanced and containing sixty-five new vocabulary items, and followed by an immediate sixty-five-item multiple-choice_vocabulary posttest, a free recall protocol prompt, and a post-reading questionnaire. These materials were presented to the subjects at the first session of the task. For the second session, a delayed posttest and an exit questionnaire were presented to the subjects. With the exception of the questionnaires, the materials were designed to be administered in the laboratory during class time. The items in the questionnaire and the test components of the task were arranged in a one-way linear structure that did not offer the option of coming back to a previous screen except for the reading when the subjects had not moved away from the text. Once a student moves away from the reading screen, it was impossible to come back to it. The reason for not allowing backward movement from one screen to another is to guarantee that the students do not change the responses that they initially submit.

3.6.1 Software preparation.

The Reading Toolbox (2003) software was adapted with Macromedia Director MX 2004 for use in this study. The reason for selecting this software for adaptation and use in the project was that it is software for hypertext reading and open for use in a variety of applications. It is appropriate for learning vocabulary from enhanced text. The reading text and enhancements that were in Microsoft word format were imported into Director for the design of the Implicit and Explicit versions of the program. Some of the

graphics used for the enhancement were imported from the World Wide Web, using Adobe Photoshop 7.0, and others were scanned with an HP scanjet 5590 scanner. The graphics were saved as JPEG files and adjusted in size and resolution to fit the window on the Reading Toolbox (2003) page to the right of the reading text. The sounds were recorded using the Audacity program and saved as MP3 files before being embedded into the Director software. Four separate sets of programs were made of which the two first were prepared for the first session that was held in the laboratory. Each of the participating students came to the laboratory at their class time for this first session. The material for the first session contained the background questionnaire, the reading task, the immediate vocabulary posttest, the recall protocol, and the post-reading questionnaire. Each of the experimental groups had their own assigned tasks: one for the implicit group and another for the explicit group. The two other software prepared for the second session contained the delayed vocabulary posttest and the exit questionnaire. Here again, one copy was specified for the implicit group, and the other for the explicit group. The four projectors were installed in two special and password protected accounts set up for the project on the server of the College of Humanities. An incorporated device recorded all movements within the software, specifying where, how many times, and how long a subject clicked on any item in the text. The software provided free space for the subjects to type their answers after reading the text described below.

3.6.2 Selection of the reading text.

According to Fecteau (1999) the use of literary text for language instruction is more appropriate than other text types as literary texts yield better reading activities as they are better structured. He also supports that literary studies “hold a privileged place at advanced instructional levels, particularly at the college level.” For this reason, a literary text was chosen for the reading. The text is a 479-word narrative (See Appendix A) taken from *Les Petits Enfants du Siècle* written by Christiane Rochefort, a French writer of the twentieth century. It is an authentic, highly descriptive, and well-written extract from a contemporary and conversational modern book about children of the “ghetto” written for a French audience. The book is classified in the category of mystery novels and other readings used in writing teaching materials. The reading activity is followed by two short tasks: a vocabulary acquisition test and a comprehension task. As authentic as it is, the text was enhanced with hypertext additional information to the target items that were described as difficult by previous students of FREN202.

This specific text was used to replace another passage of Rochefort’s chapter that is included in chapter 9 of the textbook *Ouvertures* 3rd edition, in use at The University of Arizona in the fall 2006 semester in which the study was done. All six classes at that intermediate level of at the Department of French and Italian were using the same textbook and proceeding at approximately the same pace. The researcher prepared two slightly different electronic versions of the text for the activity: one for the implicit group, and the other for the explicit group. Both versions were enhanced with text, graphics and

sound, immediately accessible to the subjects at mouse click. In spite of their similarity, the two texts had features that make each unique in its condition.

As for the choice of the target items, twenty-two FREN202 students from one class of twenty-two (22) and another one of seventeen (17) at the same level of proficiency were asked to read the text and underline the words that were new and unknown to them. All the words identified by this group as difficult were included in the list with reference to Horst and Meara's (1999) checklist that asked the learners to mark the target word with "YES" as known, "NS" as having an idea on the meaning of the word, and "NO" to indicate that the word is not known at all. For the procedure used in present study however, the subjects were only asked to underline the words that are not known to them. A total of sixty-five items were selected based on the metric of percentage of students who marked them as unknown. Using Nation's (1990) notion that a learner has to know 95% of the words in a text in order to be able to effectively learn the remaining 5%, the researcher used the report of items unknown by the students at 90% in order to be classified as a problem item that needed attention. The researcher, who did this preliminary quest for classroom use, considered that beyond a report by 90% of the subjects, a vocabulary item must be accepted as a "problem item" and included into preliminary or remedial action to help learn it.

The marked words were counted, and each word or phrase that was marked as unknown by twenty (20) students out of the twenty-two (22) in the first group and by fifteen (15) students out of seventeen (17) in the second group were retained as targets for remedial study. This metric used for class work was replicated in the study. The sixty-

five items were made salient through highlighting and were hypertexted to additional enhancement in order to help the subjects to better understand them. After the target items, a language background questionnaire was designed as detailed next to elicit the demographics of the target population.

3.6.3 Background questionnaire.

The introductory background questionnaire was based on Dornyei's (2003) checklist of participant characteristics sample (pp. 122-123) that suggests items including but not limited to total number (of eligible people), age, gender, ethnicity, grouping variables, level of second language (L2) proficiency, L2 learning history, L2 teaching institution, type of tuition received, general aptitude or academic ability, socioeconomic background, participants' occupation or area of specialization, L2 class size, L2 teaching materials used, and amount of time spent in an L2 host environment. In order to match this list to the specific circumstances of the study, an adaptation of the characteristics relevant to the present study was produced by the researcher. It is a combination of personal information and language learning background, experience, and perspectives.

The objectives of the questionnaire were diverse. First, it was meant to obtain demographic information on the subjects' language background such as to identify first language speakers of French who had to be eliminated from the study because their participation may confound the results. It was also meant to find the types of motivation the subjects had for learning French. The questionnaire is divided into four (4) sections. The first section aims at eliciting personal information such as age and gender. The

second section targets the subject's language background. It enquires about the additional language(s) spoken by the subject and the duration of study of French, the intended future use of the French, frequency of genuine communication in French, frequency in reading culture-related materials in French, number of hours of use of the World Wide Web, exposure to francophone TV and radio programs to practice French. Sections three (3) and four (4) of the language background contain two (2) multi-item scales respectively focusing on learning foreign languages in general and learning foreign language vocabulary in particular, with four (4) points each. Dornyei (2003) suggests that single item-questionnaires are fallible and that a general consensus among questionnaire specialists is that researchers need to use more than one item aimed at the same target to address each identified content area. This use of multi-item or summative scales allows several and differently worded items to focus on the same target and allow the idiosyncratic interpretation that can be averaged out during summation of the item scores. The electronic introductory questionnaire used in this study elicited demographic information from the subjects on the same day at the beginning of the reading activity. Its items were designed in a repetitive format (Dornyei, 2003) in order to obtain all the necessary information expected for each of the notions under investigation (see Appendix B). The questionnaire was coded according to characteristics and categories subject to their appearance in the answers supplied by the subjects. Among these general categories and characteristics to the study were nationality, gender, and type of motivation.

3.6.4 Measurement tools.

The major tools of measurement used in this study are a multiple-choice vocabulary test for the assessment of immediate and delayed retention, and a recall protocol to assess comprehension. The multiple-choice questions test has sixty-five items with four options each. The questions were designed to assess the meaning retained by the students as a result of reading the text and accessing the additional help offered through hypertext. As for the recall protocol, it is a free recall of the narrative in which the subject is asked to write down everything he or she recalls from the story. Multiple-choice questions are chosen for use because they are easily marked, good for testing factual information and for online use and assessment. They save time and resources and can be used formatively or summatively.

3.6.4.1 The recall protocol.

In the recall activity designed for the assessment of comprehension, the task was in English, the common language of the subjects, based on the procedure suggested by Bernhardt (1991). A recall protocol can be defined as an activity intended to measure comprehension of the text content at the end of the reading task by asking the subjects to write down everything that they remember from the text (Barnet, 1988; Bernhardt, 1988) without being guided by any leading question or other directions. According to Fecteau (1999), “a recall task entails reproducing a text (verbally or in writing) that one has read without referring back to it; thus, meaning construction is not conditioned by prompts, questions or cues” (p. 491). The present recall was done in writing, and the use of English

helps to avoid loading the students with two tasks for one activity (Sweller, 1999; Bernhardt, 1991). If the subjects had to write the recall in French, there would be the extraneous constraints of producing written language in French and the possibility of failing to express what they really mean due to the limitations in the target language. Considering the fact that second language readers at the university level are literate in their first languages, and that reading is a cognitive, social and meaning-centered process, the recall protocol was built with reference to some elements of Bernhardt's (1991) steps in the procedure for a recall protocol. The immediate recall protocol is based on the constituent structures of the text, and it tests students' abilities to understand written foreign language texts without the help of outside materials or guiding questions. But in the case of this study, this activity is done with the help of the enhancement hypertext to the target items. The recall protocol also shows how well enough a reader understands a text by being able to use it in a written form.

3.6.4.2 The immediate post-test.

For the immediate posttest, the researcher employed a 66-item multiple-choice exercise written in French, the target language of the learners. The rationale behind choosing a Multiple Choice Question test type as a tool of measurement for the subjects' performance is that multiple-choice tests are objective tests and allow more accurate assessment of the subjects' performance than most other test types. The 65-item MCQ is based on the actual words that were highlighted and hyperlinked to the additional help for the participants to access and understand. It focuses on the meanings of the target words

covered in the task (See Appendix C). The items consist of sentence stems with underlined target words, to be completed with one of four alternative options presented as paraphrases or synonyms for the underlined words. Each of the items had 4 alternative answers for the students to choose from. One option is more appropriate and the three others are distracters. The test assesses retention of the newly learned vocabulary items immediately after the treatment. This first and immediate assessment aimed at assessing the immediate retention of the target words.

The content of the task is valid in that it provides descriptions of the words and expressions presented in the activity, without adding anything that was not part of the input. It has face validity and can be confirmed at first sight. The test actually measures knowledge of the vocabulary words it is meant to assess.

In order to verify the occurrence of a deeper and clearer understanding of the target words, alternative synonymous terms are associated in the multiple-choice items. For example, in order to assess understanding of the words *une maitresse*, *tant*, and *essayer*, the following others close in meaning were used: une maitresse: a) professeur b) enseignant c) maitresse d) bonne are used; and for tant: a) quelque peu b) tant c) peu d) assez bien were offered as a list of alternatives. As for *essayer*, the list was constituted of: a) bien l'observer b) le mesurer c) l'essayer d) l'adapter à votre taille.

As for grading the participants' responses to the vocabulary test, a grading rubric was developed by the researcher and numerical values were attached to each item (see Appendix D). The rubric was reviewed by two of the teachers who used the program in

their own classes. Every correct response was credited with a full point. The rubric was used for grading both the immediate and the delayed posttests, as both are the same test.

3.6.4.3 *The post-reading questionnaire.*

The post-reading questionnaire was adapted from Ercetin (2001). It is a combination of six (6) multi-item Likert style scales and eight (8) general qualitative information questions (See Appendix E). It is a construct that combines the quantitative data with some qualitative additions that can bring to the study what may not be available in a purely quantitative analysis. The Likert style questions aim at investigating a number of factors: the effectiveness, interest, ease of use, helpfulness and “enjoyability” aspects of the program; the evidence or lack thereof of the correlation between the effort invested to comprehend the text and the actual vocabulary retention; the perceived agency in the retention of new vocabulary as a result of doing the task; the perceived level of difficulty of the comprehension and vocabulary retention activity; and the usefulness of the glosses in helping to comprehend the text and retain new vocabulary. As for the information questions, they focus on the adequacy of the time allocated to the activity; preference between paper text and electronic text; the ease of navigation within the program; and the usefulness of the different glosses in comprehending the text on the one hand, and retaining the new vocabulary on the other. The post-reading questionnaire also asks questions on readiness to use at least some of the words learned through the program. Finally, it asks the subjects to provide any general suggestions they may have. This

questionnaire concludes the tasks of the first session while the second session starts with the delayed posttest.

3.6.4.4 *The delayed posttest.*

The delayed post-test was the assessment task given to the subjects after the instructional input, in the same way as for the immediate posttest. It differed from the immediate posttest in that it was administered three and a half weeks after the reading. It used the same 65-item multiple-choice vocabulary test that was employed for the immediate posttest. The objective of this test was to assess the level of retention of the vocabulary learned with the initial reading in the project, and to measure the degree of divergence or convergence such as loss, maintenance, or increase in the quantity of the vocabulary items acquired, between the immediate and delayed posttests. The posttests were intended to record the impact of the reading task on the subjects at these two different points in time. This assures a better level of accuracy in the measurement of variation in retention over the specified times. Both posttests were graded in the same way with the same rubric and grade allocations.

By retaking the same test, the subjects would provide a clearer means of comparison at the two levels. The comparison will show how much of what they retained by the end of the reading task would still be in memory by the end of the fourth week. The result of this task will also help to show if the subjects in the two conditions perform at the same level or differ, and if one or the other conditions would lead to longer

retention. At the end of the delayed posttest task, the subjects fill out an exit questionnaire that is briefly described in the next section.

3.6.4.5 *Exit questionnaire.*

The exit questionnaire is an overall evaluation of the program and the subjects' evaluation of their own performance in the task (See Appendix F). It has many aspects in common with the post-reading questionnaire and is divided into seven sections: Section one (1) focuses on the description of the program. Section two (2) asks about the relation between comprehension and retention. Section (3) three invites the students to quantify the level of retention, and reveal the strategy used in the retention. Section four (4) is an evaluation of the glosses. Section five (5) asks for additional comments. Section six (6) asks the question of readiness to use some of the target words in real-life situations, and section seven (7) requests general suggestions, all in the participants' own words and in English. But before the real project, all these materials were piloted as described in the next section.

3.6.5 *Piloting the materials.*

A pilot study of the material was done with eight volunteers. The participants came individually into the laboratory, filled out the questionnaire, read the text, took the vocabulary test, wrote the recall exercise, and filled out the post-reading questionnaire. Two days later, they came back, retook the vocabulary test and filled out the exit questionnaire. The objective of the pilot study was to find out possible discrepancies in

the form and content of the program and materials and how smoothly the series of activities would flow. Before the pilot study, the materials were given to two instructors of French for comment. They found a few errors and made constructive suggestions that were incorporated into the task. One of them pointed out that the two questionnaires had a number of points in common that could be eliminated, but the other argued that the similar points would allow eliciting all or most of the expected reactions. Some adjustments were made. The pilot study showed how well the program worked, and the participants' comments informed the researcher on the level of help provided by the program. With a second review, the instructors described the readjusted program as valid and ready for use.

As was confirmed by the pilot test and the inter-rater reliability test, the present test is described as valid and has strong reliability. Because of the design of the items and responses, whoever does the reading and all associated activities and then takes this test will definitely choose the same appropriate options, if he or she has acquired the target words and expressions. More than 80% of the answers provided by the subjects in the pilot study provided information within the meaning associated with the target items.

3.7 Data Collection

At the beginning of the set of tasks, the subjects received an orientation session that provided verbal instructions on how to use the software, (2) how to navigate the program, and (3) what to do with the reading text. The two groups of participants received two slightly different treatments for the investigation of their performance in

acquiring new vocabulary from a hypertext reading and comprehending a literary text. They were also instructed to write down everything that they remembered from the text as a display of their understanding of the text. The overall data collection was structured according to the steps described below.

3.7.1 Setting and timing of the study.

Data collection was done on the computer during regular class times in the Multi-use laboratory of the College of Humanities in the Modern Languages Building, in the first and last weeks of November 2006. The Multi-use laboratory is equipped with thirty-five computers for research, as well as additional workstations for diverse technological uses in the humanities and education. The laboratory is regularly used as a classroom for teaching with the computer and other technological devices when each student uses a work station for and by himself or herself.

The study was done toward the end of the semester because the text replaced by the one used in the study is found at the end of the chapter before the last one in the schedule. The task was used as part of the regular classroom activities of the semester and integrated early on into the syllabi of all the participating classes. The students came to the laboratory at their regular class times with their professors for both sessions.

3.7.2 Group assignment procedure.

The subjects were randomly assigned to either the Implicit Group or the Explicit Group, and each received a preliminary username and password to log onto a computer in

the laboratory. By logging on with these assigned usernames and passwords, the subjects were directly taken to the screen to which they were assigned. They were then instructed to create their own user names and passwords for use in all of the activities of the program. Simple random sampling, as suggested by Patten (2002 p. 41) in which representative bits of paper are mixed up in a container from which names of the participants are drawn, was adopted in assigning the subjects to the two treatment groups. In order to obtain an approximately equal number of participants in each group, an equal number of small cards with the usernames and passwords to one or the other of the two treatment conditions were presented to each subject as he or she steps into the laboratory. Each time that a class was supposed to come into the laboratory, a number of cards equal to the total number of students and equally distributed between the two treatment groups were shuffled up and put together in a box. In order to avoid an imbalance between the two groups, equal numbers of cards from both conditions are presented to the incoming students. First, three quarters of the total number of subjects in the class were shuffled together and one quarter was set aside so that even in the event that one quarter of the subjects did not report to the laboratory, the two groups present would still have approximately equal numbers of subjects. Every card drawn by a subject is indefinitely set aside. The box was shaken in all directions, opened, and held above the researcher's head. Every subject who arrived received the instructions to reach in the box and pick only one piece of paper. The notes on the cards showed the students whether they were assigned to the Implicit or Explicit group. The other side of the card provided the subject with a user name and password to be used to log onto any computer in the Laboratory

and then proceed directly to the treatment condition to which they were assigned. Special codes were chosen to identify each participant's production. Thirty-nine subjects were randomly assigned to each group, and they were immediately provided with the necessary instructions and explanations on how to do the tasks.

3.7.3 Duration of the treatment.

The different activities in the program were integrated in a single software package and presented as a string of activities. Apart from the reading task, all the other activities were exactly the same for both groups. The first session lasted for a total of approximately one (1) hour. Eight (8) minutes were devoted to the verbal instructions, explanation of how the program works and filling out the background questionnaire. Twenty-five (25) minutes were allocated to the reading/vocabulary learning activity; ten (10) other minutes to the vocabulary test, and the final seventeen (17) minutes to the recall exercise and the post-reading questionnaire. The subjects were instructed to move on to the next activity each time they finished the one at hand. For example if a subject finished reading the text in fifteen or twenty minutes, he did not have to wait for the end of the twenty-five minutes before moving to the vocabulary test. Three and a half weeks later, there was a ten-minute (10) delayed posttest and a ten-minute (10) exit questionnaire including multiple-choice and sentence completion items. The delayed post-test had the same 65-item multiple-choice vocabulary task as the one used in the immediate vocabulary post- test. The exit questionnaire allowed for personal comments

on what the subjects thought and felt about the task, the test, the software. Their recommendations also were requested.

3.7.4 The reading activity.

The reading task was the major tool of the study. It was preceded by a background questionnaire, and then followed by an immediate vocabulary post-test, a recall protocol, and a post-reading questionnaire as a first set of tasks presented in the first session.

Before doing the activities, the subjects received verbal instructions including how to use the software and how to navigate the program. The group-specific information is included in the written instructions contained in the software. Before going to the reading task, the subjects were asked to fill out a background questionnaire of a number of items focused on demographics, language background, reasons for learning French, manner in which the student came to be part of the present course, and future plans with the French language. The instructions for the implicit group did not indicate that the exercise was designed for learning vocabulary. The subjects were instructed to read the text for comprehension. The target words were highlighted but the highlighting on the words disappeared with the first mouse click. The target words were hyperlinked to the same enhancement resources as those in the explicit condition. As already described in earlier sections, the glosses were translations in English, graphics, and sound tracks. In order to have all the enhanced words consulted by the students in the explicit condition, the software was programmed to only allow the students to go to the step beyond the reading only if they had clicked at least once on every highlighted word. They could also

click on a word as many times as they wanted and yet the highlighting remained in place. The text was in permanent display on two successive screens and the students read it, and clicked on unknown words to access the meanings by choosing the text, graphic, and/or sound options that were offered. As the subjects read the text and clicked on words to access enhancements, the embedded program recorded their entire mouse click, and generated log files. In the log files, all the words that received a mouse click, the type of enhancement, and the duration of the reading were compiled in their chronological order. The indications “Text,” “Graphics,” or “Sound” in front of a word showed the type of gloss accessed for it and the length of time spent on each gloss. When there was no information hyperlinked to a word on which a subject clicked, the indication “No Information” appeared.

3.7.4.1 Screen display.

In both conditions, the text was presented in exactly the same way with the enhanced text on the left side of the screen, the space for the display of the additional on-demand information on the upper right side, and the navigation buttons at the bottom right of the screen as shown in the screenshot below.

Both screens had the text on permanent display as well as navigation buttons at the bottom right of the screen. All the components of the task were linked to each other in series. For the first encounter, the background questionnaire was presented first, followed by the reading activity, the first post-reading test, and the recall protocol. As for the delayed posttest, the same multiple-choice question task as in the immediate posttest, and

the exit questionnaire were serially connected. All of the components in each of the two encounters were connected in the software in such a way that the students could go from one activity to the next very smoothly and step by step in the proposed order. For example, in order to do the test, the student had to do the reading first. As shown in the screenshot below, the reading text appeared on the left part of the screen, with the enhancements highlighted in blue. In the space on the right, whenever a chosen enhancement received a click, the image would show as long as the mouse was not released. This allowed the subjects to look at the images that were presented with the target items as long and as many times as they chose, until they moved to the next screen. On the screen number 1 that was allocated to the Implicit Group, once a reader clicked on a highlighted item, the highlighting disappeared and the item became plain as the non-target words.

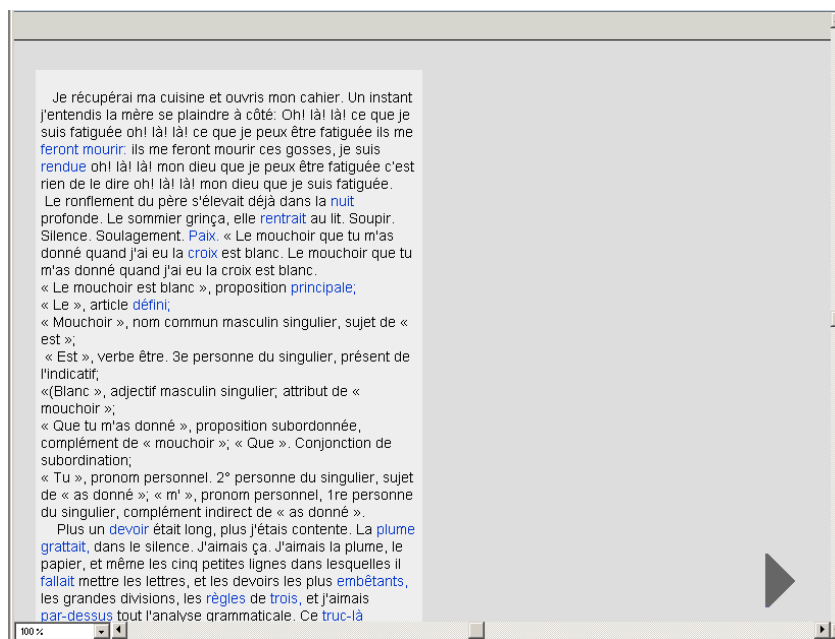


Fig. 3: Screenshot of the Software and Text (Implicit Group)

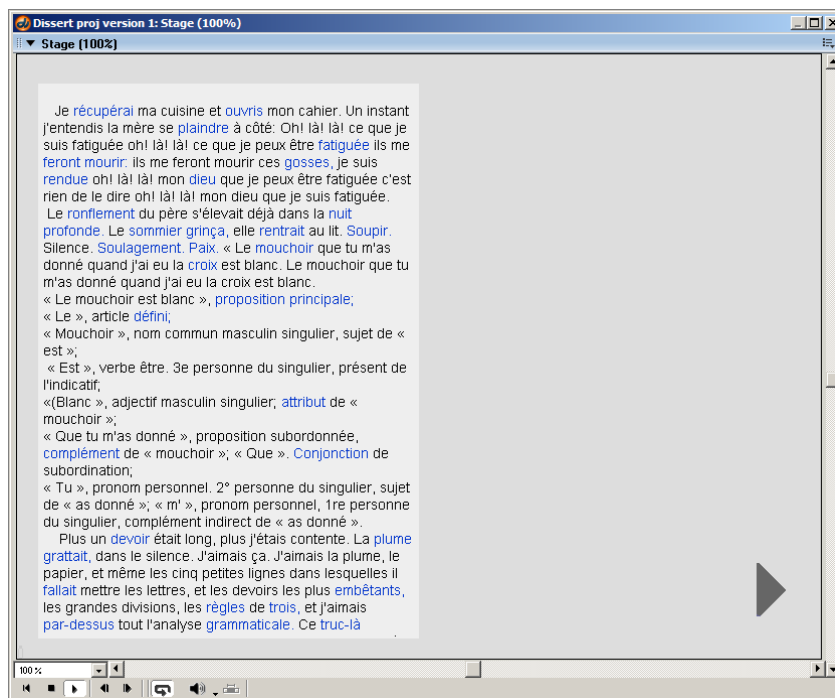


Figure 4: Screenshot of the Software and Text (Explicit Group).

3.7.5 Implicit group.

Members of the implicit group were instructed to work and comprehend the text without telling them to focus on the target words. They were given both verbal and written instructions. The verbal instructions were formulated as follows:

If you have chosen the username <chad-i>, then you need to read the text very carefully in order to understand it very well before a follow-up activity. A few words are highlighted in blue. In order to help you understand the text very well, additional help is provided to you for the words that are highlighted. If you do not understand a word in blue, all you need to do is to click on it, and you will see the links to the additional information appear near the words that will indicate one, two, or all three of the labels

“text,” “graphic,” or “sound.” Click on a link and hold down the mouse button for the time you need to read or observe the additional information. When you release the button, the text, graphic, or sound will disappear and the blue color will change into a regular black just the other words. The word will lose its highlighting but it will still be linked to the additional help. If need be, you can repeat the process for any word of your choosing and as many times as you like. To complete all the activities, finish an activity and click on the arrow to go to the next page. When you reach the second part of the activity, there will be a window for you to type in your information each time. At places, you will be asked to enter letters or numbers, and phrases or even longer texts. More instructions are provided on the computer.

In addition to the verbal instructions, there were more written instructions embedded in the activities. The written instructions given to the implicit group differ from those offered to the explicit group as shown below.

Read the following text. Click on the words in blue to get definitions, graphics, and sounds, to help you understand the text.

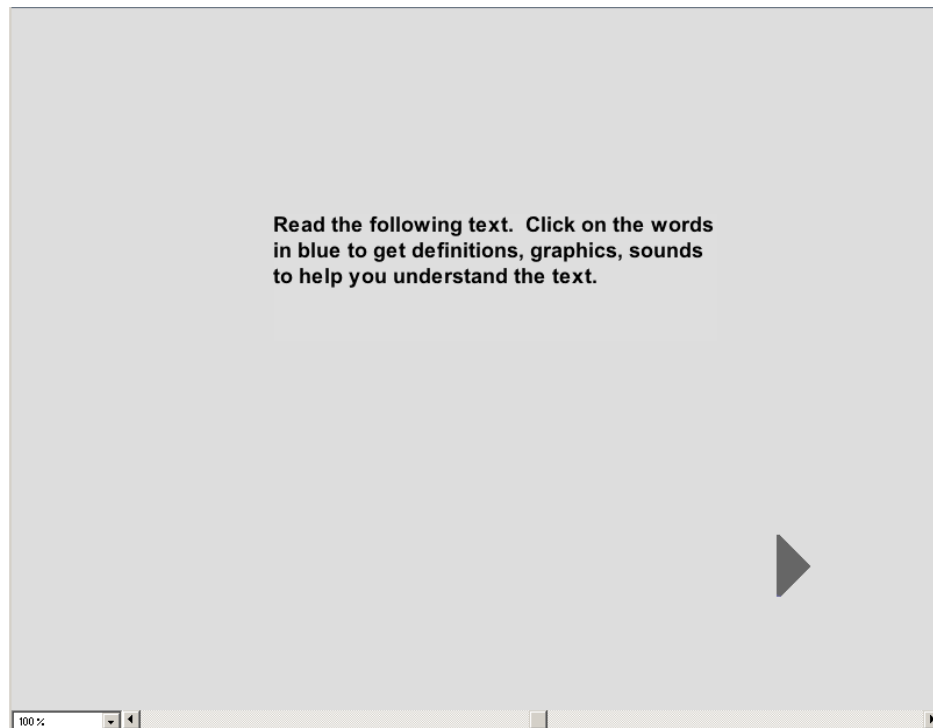


Fig. 5: Screenshot of the Written Instructions Given to the Implicit Group.

3.7.6 Explicit group.

In addition to the verbal instructions, the subjects in the explicit group were given instructions on the actual objective of the reading activity. They were instructed to read the text to understand and memorize the targeted vocabulary words. The verbal instructions ran as follows:

When you log on to the project page with the username <ndj-e>, then you need to read the text and understand the words in blue in order to do the next part of the activity.

If a word in blue tends to be unclear to you, all you need to do is to click on it, and you will see the links to the additional information that shows one, two or all of “text,” “graphic,” and “sound” that appear near the word. Click on a link and hold down the mouse button for the time you need to explore the additional information. Depending on your choice, you will see the text, the graphics, or you will listen to the sound provided. When you release the button, the text or graphic will disappear but the blue color of the word will not change. If necessary, you can repeat the process for any word that is highlighted in blue as many times as you like. In order to go to the next page, you need to have clicked at least once on every word in blue. If you do not, it will not be possible to move forward. To complete all the activities, finish one and click on the arrow to go to the next page. When you reach the second part of the activity, there will be a window for you to type in information each time. At places you will be asked to enter letters or numbers, phrases or even longer texts. Additional instructions are available on the computer. The written instructions given to the explicit group differ from those offered to the implicit group, and are formulated as follows:

Instructions: Read the following text. Click on the words in blue to obtain definitions, graphics, and sounds, to help you understand and memorize their meanings.

To complete your task, you must click at least once on every word in blue and select at least one of the options (text, sound, and graphics) to change all the blue words into black. If you do not, you will not be able to advance to the next section.

Figure 6 below shows the instructions specifically provided to the explicit group subjects.

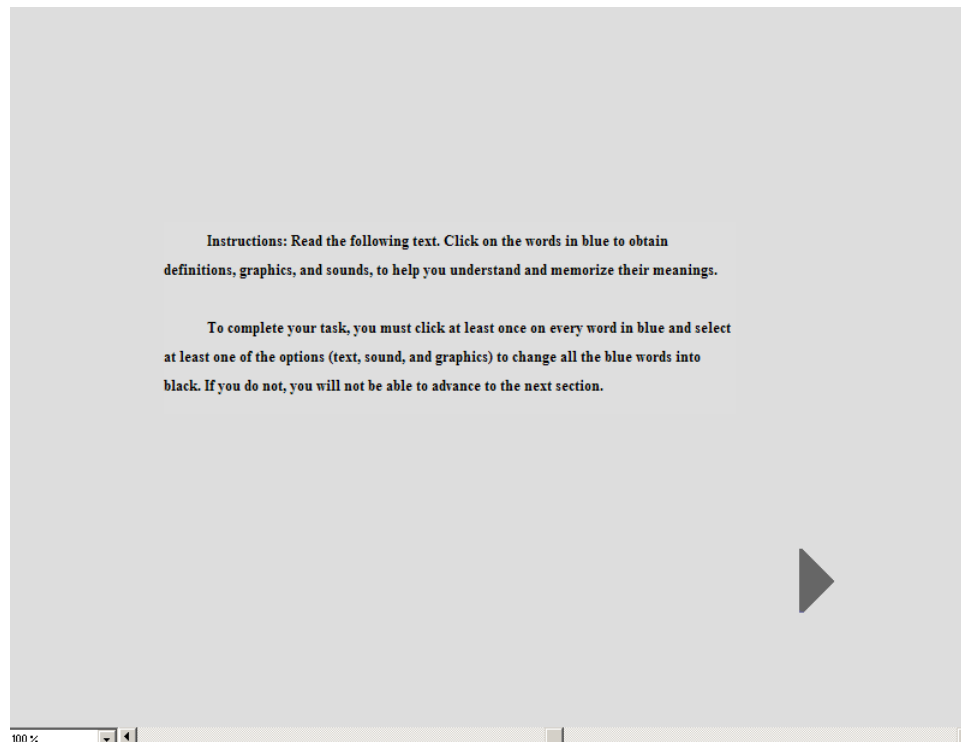


Fig. 6: Screenshot of the Written Instructions Given to the Explicit Group.

3.7.7 The immediate posttest.

As soon as the subjects in both conditions finished the reading task, they had access to the link to the same 65-item multiple-choice vocabulary posttest that was connected to the reading. This task was the same for both groups and the instructions were as follows: "Please read carefully and type the letter a, b, c, or d that represents the best answer in the space provided below each question." The subjects then read the questions, provided their responses, and proceeded to the recall protocol. Below is an example of the screenshot of the multiple-choice vocabulary test.

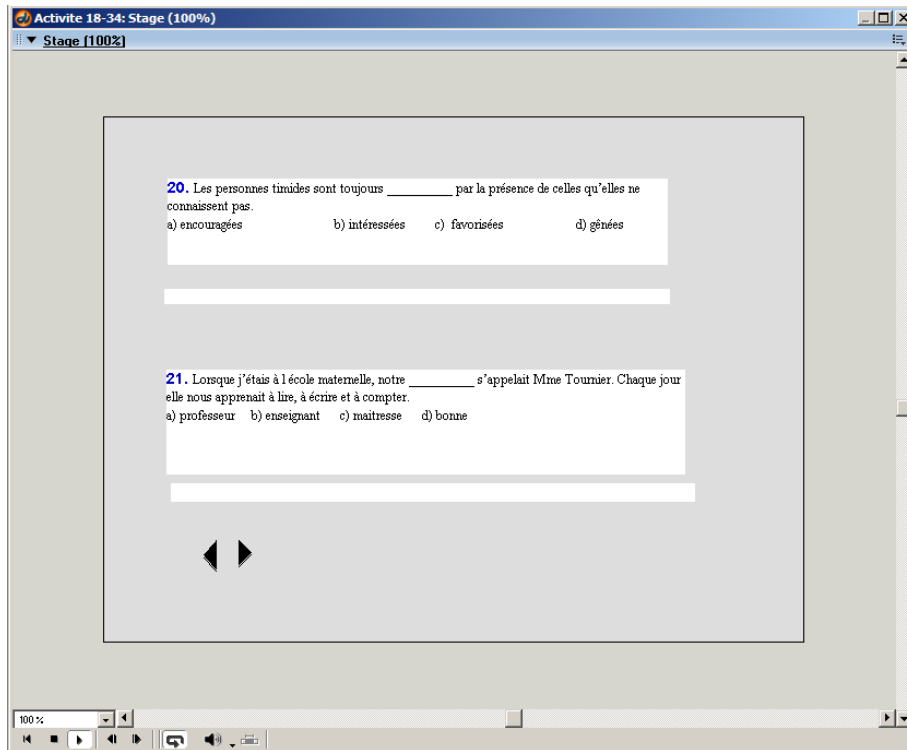


Fig. 7: *Sample Test Screen*

3.7.8 The recall protocol.

After the subjects finished the eight to ten-minute multiple-choice vocabulary test posttest, which also provided a break between the reading and the recall in order to set the recall exercise as separated from the reading activity itself, they immediately did the recall exercise. The treatment was planned in such a way that the subjects who finished one task could proceed to the next one without waiting for additional instructions, as the tracking device in the software was recording their movements on mouse click. However, the timing was distributed as follows: eight minutes were allotted to the verbal instructions and the background questionnaire, 25 minutes to the reading and vocabulary learning, 10 minutes to the multiple choice vocabulary test, seventeen minutes to the

recall protocol and post reading questionnaire. The boundaries were flexible and the duration of the reading was monitored technologically.

For the recall protocol, the subjects were only given a prompt that asked them to write down in English (Bernhardt, 1991) everything that they remembered from the text. In order to strictly limit the result to the participants' actual efforts of comprehension, and to avoid confounding the results, the readers did not receive guiding questions (Fecteau, 1999; Barnet, 1988). The actual instructions were formulated as follows: "Please type everything that you remember from the story '*Les Petits Enfants du Siècle*' by Christiane Rochefort in your best ENGLISH in the space provided below." Once the recall task was started, it was no longer possible to go back to the text. The use of the recall protocol immediately at the end of the treatment aimed at reflecting the subjects' actual comprehension of the text. The first session finished with the responses to the post-reading questionnaire.

3.7.9 The post-reading questionnaire.

This questionnaire was presented to the subjects immediately after the reading the text, taking the immediate posttest, and completing the recall protocol. Its objective is to gather the subjects' comments on the relevance of the program, its ease of use, how much they benefited from it, and if they felt ready to use some of the words that they learned through the reading in real life. In their responses the subjects answered multiple-choice questions and responded to a set of information questions by typing their reactions to the prompts in the space provided. The post-reading questionnaire is the last in the string of

activities done during the first session. At the end, the subjects were instructed to submit their responses by clicking on the submit button as soon as they finished typing. The second phase of the project was carried out three and a half weeks later in the same laboratory and under the same conditions, except that there were only two tasks: the delayed posttest and the exit questionnaire.

3.7.10 The delayed post-test.

The second session of the project took place three and a half weeks after the first one. It was carried out in the same laboratory and under the same conditions. The main difference between this session and the first one was that it only had two activities: the delayed posttest and the exit questionnaire. These two activities were scheduled for ten (10) minutes each, even though the whole hour was booked for the session. The delayed posttest used the exact same tool as the immediate one. The subjects responded to the 65-item, multiple-choice test exactly as they did in the first session of the project and working with the same content. Afterward, the subjects filled out the exit questionnaire.

3.7.11 Exit questionnaire.

The exit questionnaire concluded the subjects' participation in the project and the questionnaire evaluated the project overall. The subjects were requested to type the letter-number combination answers to the multiple-choice items and type in their own comments on their levels of readiness to use some of the target words before giving their

additional comments. As they finished the activity and left the laboratory, the participants received words of gratitude from the researcher.

3.8 Coding and Scoring Procedure

The acquisition of vocabulary is measured by the level of performance on a multiple-choice vocabulary test, and comprehension is measured by the level of performance achieved on a recall exercise. In addition, the choice of gloss is perceived as a predictor of the level of performance in two vocabulary tests and a recall protocol. The different measurement tools were coded to control for the number of variables to assess but more precision in the assessment contexts. Closely related situations were grouped under relevant categories and translated into rubrics in each condition.

3.8.1 Background questionnaire.

The language background questionnaire used repetitive language in order to elicit as many response types as possible. After close observation of the results, not all the points were coded. Only those responses that provided more pertinent data were included in the coding sheet. The points that provided more pertinent data were selected and related items were collapsed into categories representative of the conditions under investigation. In order to make the results easy to compute statistically, the outcome of the background questionnaire was coded numerically (See Appendix G). The representative numbers were used in the SPSS program for computation.

3.8.2 The Multiple-Choice vocabulary test.

Coding the multiple-choice test was based on a number of items. Every right choice that matches the rubric was coded to receive one (1) point, and the grading was done accordingly. As the total number of items is 65, a total of 65 points were allocated to the vocabulary test.

In order to verify the reliability of the Multiple-Choice Question test, the researcher chose to give particular attention to the points beyond one fourth of the total points. Based on (Bernhardt, 1988), the researcher argues that the points scored beyond the one fourth could be considered as clean gain by the test-takers. Beyond the threshold grade of sixteen points out of sixty-five or approximately one fourth of the total score, there is a probability that a respondent may have randomly chosen an answer that would happen to be the right one, as the items in this multiple-choice question offer four options each. This consideration would eliminate the chance of an interaction of a mere guess that Bernhardt (1988) describes as allowing the participants to “guess their way out” (p. 32) and that is the weak side of multiple-choice questions. Every point scored beyond this threshold can be considered as the result of a definite acquisition.

Table 4: Summary of the Coding for the Multiple-choice Vocabulary Test

	Items	Allocated grades	Possible grades
Individual points	1 item	1 point	0 or 1 point
Total	65 items	65 points	0 to 65 points

3.8.3 Recall protocol.

In order to quantify the results of the free recall protocol, the entire text was coded into units of ideas based on Lee's (1986) assertion according to which it is more operational to code the recall production of L2 learners into units of ideas that may be individual sentences, basic semantic propositions, or phrases. The present study adopts the idea units' option, using meaning-based propositions and phrases, assuring that the sum of the individual units equals the total content of the text. In Smith's (2004) view, "knowledge of relevant schemes is essential if we are to read any text with comprehension" (p. 22). For this reason, the units of ideas included in the passage are identified for use with the rubric in grading the recall exercise. Thus, appropriate use of any word or expression in the response produced by the subjects would suggest at least some level of understanding.

A list of the main points of the text was written for comparison with the subjects' productions (See Appendix H). As a tool of measurement, a one-point (1) scale rubric was developed for use in grading the responses. A total of fifty (50) points, corresponding to the number of idea units carrying meaning, was assigned to the task. Depending on how well the ideas were remembered, the points given to each of the idea units can varied between 0 and 1.00 by increments of .25 per stage, with 1 as perfect, and 0 as completely wrong, and the partial grades on the continuum.

Table 5: Summary of the coding for the recall protocol

	Units	Allocated grades	Possible grades
Individual points	1unit	1point	.25, .50, .75, or 1
Total	50	50 points	0 to 50 points

3.8.4 The exit questionnaire.

The two post-treatment questionnaires were coded into positive, neutral, and negative feedback based on the subjects' responses, with positive attitude toward vocabulary learning as 1, neutral attitude as 2, and negative attitude as 3. The most recurrent and pertinent comments were grouped into themes and are commented on as qualitative additions in the results of the study. The coded exit questionnaire was divided into seven sections. Section one focused on the description of the program while section two provided details on the interrelation between comprehension and retention. Section three quantified the level of retention and the strategy used in the retention activity. Section four was an evaluation of the glosses. Section five asked for additional comments. Section six asked the question of readiness to use the target words, and section seven requested general suggestions.

3.9 Data Analysis

The data obtained from the vocabulary tests and recall protocol were analyzed using SPSS for Windows, and the results were discussed and compared to other studies.

The questionnaire items were numerically recoded as shown in the sections above for the purpose of statistical analysis. Descriptive statistics were calculated to determine the means and standard deviations. Next, inferential statistics, the analysis of variance (ANOVA), and multiple regression were completed to establish the relationship between the implicit and explicit modes of instruction and the dependent variables. In order to identify the best predictors among the independent variables, multiple linear regression analyses were conducted between the implicit and explicit instruction, and reading times.

3.9.1 Additional analysis.

Part of the subjects' responses to the post-reading and exit questionnaires were summarized as a qualitative addition to the study. The description of the subjects' opinions on the project as a whole and on specific aspects, such as the kind of benefit they obtained from the program and their levels of readiness to use some of the words acquired through the program, is provided. This part of the analysis reveals how the individual subjects globally and qualitatively evaluate the program, providing their own judgments. These answers are reported as they were presented by the subjects themselves and constitute a qualitative addition to the quantitative analysis.

3.10 Summary

This chapter provided a detailed description of the methodology and presented the types of analysis used in the study. First, it stated the research questions and presented the hypotheses and the subjects. Next, a review of the materials, including the experimental

variables, data collection procedures, and the different analyses envisioned was presented. Throughout the chapter, the informed principles guiding the study were included where necessary as evidence of informed choices. The analyses and findings are presented next in chapter four.

CHAPTER FOUR: RESULTS

4.1 Introduction

This study primarily investigates the effect of implicit and explicit teaching of vocabulary with a hypertext reading task on the comprehension of a narrative and most importantly on immediate and delayed retention of the new vocabulary presented through the reading activity. This chapter presents and analyzes the findings, using procedures specified in chapter three. The chapter presents the results and provides comparisons of the experimental and demographic data in relation to the research questions. Research question number 1 focuses on the effects of implicit and explicit teaching of vocabulary on the levels of performance on the immediate comprehension task. The first part specifically describes the results of the comprehension test taken by the implicit and explicit group members following the reading of the narrative text as a vocabulary learning activity: overt for one group, and implicit for the other.

The second part of the chapter responds to research question number 2 and presents the results of the immediate and delayed vocabulary retention tests taken on the computer. The first posttest was taken immediately after the treatment and the second one three and a half weeks later.

The third part of this chapter presents the effects of motivation on the implicit and explicit teaching of vocabulary and the results achieved by the two groups of subjects on the comprehension, immediate retention, and delayed retention tests with regards to the different motivation types. The section summarizes the intercorrelations between the results and describes how they relate to each other. The intercorrelations are observed,

first in the implicit teaching environment, and next, in the explicit condition. The chapter finally presents a summary of the findings.

4. 2 The Subjects

In addition to the experimental variables on comprehension, immediate and delayed retention that constitute the heart of the present study, motivation has shown to be interesting and is integrated into the analysis. Data about motivation were gathered from the responses to a background survey. An analysis of the data provided by the subjects in the two groups gives a description of the subjects in relation to their responses to the survey. Initially, all applicable characteristics were included in the survey so that no major pertinent aspect would be omitted. The inclusion into the analysis was attached to any pertinent demographic variable that would emerge from the subjects' self reports, and motivation was chosen. The other variables, including duration of study of French, use of French, self-rating, and attitude toward vocabulary, were judged as less pertinent than motivation and being beyond the scope of the present study and were omitted from the analysis. The general demographic variables were classified according to the recurrent features that the subjects presented as shown in the table below. The coding lists all the characteristics revealed in the entire data set, and the result is distributed by group and type of as well as within variables as shown in table 6 below.

Table 6: *Demographic characteristics of the subjects*

Between-Subjects Factors: Implicit group and explicit group

Demographic criteria		Value Label	N (implicit group)	Percentage	N (Explicit group)	Percentage
National origin		Nationality			33 US	84.61
					3 Indians	7.7
					1 Bermudian	2.56
					1 Canadian	2.56
		Total	39	100%	39	100%
Gender	1	Female	20	51.3	21	53.8%
	2	Male	19	48.7	18	46.2
		Total	39	100%	39	100%
Duration of study	1.00	0-2 years	2	5.1	20	51.3
	2.00	3-4 years	10	25.6	14	35.9
	3.00	5 years and more	27	69.2	5	12.8
		Total	39	100%	39	100%
Use of French	1.00	Reading, video and audio in class only	3	7.7	0	0
	2.00	Reading, video and audio in class and sometimes elsewhere	22	56.4	18	46.2
	3.00	Reading, video and audio beyond the class	14	35.9	21	53.8
		Total	39	100%	39	100%
Self rating	1.00	Positive	8	20.5	15	38.5
	2.00	Negative	24	61.5	15	38.5
	3.00	Neutral	7	17.9	9	23.1
		Total	39	100%	39	100%
Motivation	1.00	Intrinsic & instrumental	9	23.1	17	43.6
	2.00	Intrinsic only	16	41	8	20.5
	3.00	Instrumental only	10	25.6	7	17.9
	4.00	Requirement	4	10.3	7	17.9
		Total	39	100%	39	100%
Attitude toward vocabulary	1.00	Positive	11	28.2	14	35.9
	2.00	Neutral	21	53.8	19	48.7
	3.00	Negative	7	17.9	6	15.4
		Total	39	100%	39	100%

As is presented in the above table and within each group, the subjects were classified by nationality, gender, duration of study of French, motivation type, attitude toward learning vocabulary, and by type of use they make of the French language. Most of the students in both groups were American. Nevertheless, there were a few of other nationalities as well. In both conditions, there were more female than male students. As for the duration of study, there were three broad categories represented by zero to two years, three to four years, and five years and more of study of French. Regarding the motivation types, four categories were elicited from the survey responses among which there were an *intrinsic and instrumental* motivation group, an *intrinsic only* group, an *instrumental only* group, and a *requirement* group. The intrinsic and instrumental group represents the subjects whose motivation was twofold: they had both a personal and self-motivated reason as well as a type of motivation linked to some kind of reward for learning French. The intrinsic only group was the one whose motivation was purely personal and not related to any external source. The desire of the members of this group to learn French did neither come from an outside source nor did it aim at any sort of compensation. The instrumental only group was based on motivation by some kind of reward such as being successful in school, obtaining a job, or being able to operate in a French speaking country in the future.

The other characteristics such as nationality, gender, actual use of French, and self-perception have been dismissed from the analysis in order to keep the focus of the study on the experimental variables and only include the most important demographic variable. The present study also focuses on the teaching modalities and primarily defines

the subjects as intermediate students of French 202. This consideration derives from the fact that what was essential in the criteria was being regularly registered in the intact class that participated in the study. All other considerations related to the demographic characteristics of the subjects were not included in the analysis. Another reason for excluding most of the demographic information on the subjects was to keep the study the least qualitative possible in order to keep it at a level of major focal interest and a manageable size. Motivation factors were retained for inclusion in the analysis as they are likely to affect both the levels of comprehension and retention, either immediate or delayed as supported by Dornyei (1999, 2000) who asserts that affective factors can determine the level of performance achieved by learners. The subjects of the study were from intact classes and thus equivalent in proficiency level. The random assessment operated on assigning them to the implicit or explicit group produced an equal number in each group and condition. This provided a balance in the data and its analysis. A descriptive statistics summary of the two groups with a confidence interval of 95% ($p < .05$) revealed a similar standard deviation of 11.401 ($SD = 11.401$) for $N=39$ and the same level of variance of for $N=39$ for each of the two groups. Additionally, through a value of F of 146.219 $df (76, 1)$ and a level of significance of .066, a Levine's Test of Equality of Error Variance computed with all demographic variables also showed that the subject groups were equal at the onset of the study, thus, the groups were statistically equivalent. The significance level for the test was set at $p < .05$. The research questions are discussed in the next section.

Table7: Descriptive statistics of the reading times recorded for the two groups

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Total Reading Time	Implicit 2457	677	129	806	1018080	414.36	3.341	165.607	27425.649
	Explicit	876	136	1012	1474074	599.95	4.022	199.341	39736.888

4.3 Research Questions

4.3.1 Research question # 1.

- 1) What is the effect of implicit and explicit teaching of vocabulary on comprehension?
 - a) What is the effect of implicit teaching of vocabulary on text comprehension?
 - b) What is the effect of explicit teaching of vocabulary on text comprehension?

4.3.1.1 The effect of implicit vocabulary teaching and learning on the comprehension scores of the implicit group.

This section of the results presents and compares the comprehension scores obtained by the subjects in the implicit and explicit groups. First, it presents and comments on the raw scores as well as the descriptive statistic of the different results obtained by each group, and then it contrasts the findings of the two groups in order to highlight the differences and similarities. Table 8 below shows the results of the comprehension test achieved by the implicit group members as a result of learning vocabulary in the implicit teaching condition. It is a measure of the level of performance

achieved by the subjects, and it presents the raw scores obtained by the individual members.

Table 8: *Comprehension scores obtained by the implicit group.*

Implicit Group: Comprehension scores (out of 50)					
Case	Scores	Case	Scores	Case	Scores
1. Alexander	23	14. Christine	10	27. William	5
2. Jimmy	23	15. Tony	23	28. Kimberly	13
3. Michael	10	16. Erin	24	29. Eugene	8
4. Alfred	15	17. Brenda	13	30. Angelina	4
5. Jose	13	18. Zaynab	16	31. Amy	7
6. Ashley	4	19. Martha	15	32. Carol	23
7. Austin	6	20. Aaron	28	33. Gary	28
8. Elvis	20	21. Pablo	8	34. Therese	12
9. Sara	8	22. Trenton	10	35. Noelle	8
10. Joseph	28	23. Aaron	23	36. Travis	19
11. David	13	24. Emily	18	37. Jeremy	4
12. Bernice	9	25. Joyce	13	38. Adriana	9
13. Blake	10	26. Avery	6	39. Kirk	13

Table 8 above shows the raw scores obtained by the implicit group members in three columns. Under *Case* is a list of the subjects identified both by pseudo-names and numerically from 1 to 39. Under *Scores*, the column shows the respective raw scores obtained on the comprehension task by the individual subjects out of the full score of 50 points. All the 39 subjects in the implicit group provided valid data on the comprehension test. The highest score obtained on the comprehension task by the implicit group members was 28, and the lowest score was 4 out of 50 points. Three (3) subjects out of 39 received the score of 28 out of 50, and 3 others obtained the lowest score of 4 out of 50. The scores obtained by 17 of the subjects vary between 4 and 10, those of 13 subjects

were situated between 11 and 20 points, and 9 others received scores between 21 and 28 points. More details on the group results are provided in the descriptive statistics presented in the next sub-section.

4.3.1.2 Descriptive statistics of the comprehension scores for the implicit group.

Table 9 below provides the descriptive statistics of the results, including the range, minimal and maximal grades, group mean and mode, standard error of mean, standard deviation and variance.

Table 9: *Descriptive Statistics of Comprehension Scores for the Implicit Group.*

Implicit	N	Range	Mini	Maxi	Mean	Mode	Std. Error of mean	Std. Deviation	Variance
Comprehension Test Scores	39	24.00	4.00	28.00	13.89	13.00	.144	7.16	51.34

$p < .05$

The results of the descriptive statistics show that the performance levels of the implicit group subjects in comprehension were between moderate to average, as appears in table 9 presented above. Of the 50 points maximum allocated to comprehension, the highest average score obtained by the implicit group was a non significant group mean of 13.89 ($M = 13.89$, $.715$ at the $p < .05$), equivalent to 27.78% of the full score, and the average lowest score was 4.00 points or 8% of the highest possible score, for a maximum

of 28 points or 56% of the same figure. The significance level of the test was set at $p < .05$. The mode was 13 points and the standard error of mean .144. The standard deviation of 7.16 (STD = 7.16) reflects a wide gap between the group mean and the individual means. The standard deviation is the distance between the most diverted individual subjects' scores and the group mean. The variance or the representation of the percentage values of the gap between the extreme scores was at 51.34. This extreme variance reflects the level of difficulty experienced by the subjects on the comprehension task (Sanko, 2006).

The distribution of the scores shows that the subjects in the implicit group had heterogeneous levels of performance spread between the scores of 4 and 28 on a scale of 50 points. The value of the standard deviation shows that the departure away from the group mean is large and reveals that the subjects in the Implicit Group performed very differently from each other as a result of their heterogeneous proficiency levels on the comprehension of a narrative text. This dispersion of the results can be explained by the level of difficulty and the variety in the use of individual learning strategies by the learners who were only instructed to read and understand the text. In order to carry out the activity, each participant had reverted to his or her own learning strategies in the face of an absence of an elaborate guidance on the task. As the highest score obtained by the implicit group members is slightly above the average score of 25 points, the average performance on the comprehension test by the implicit group subjects can be described as intermediate. The results of the comprehensions test appear to be very poor in comparison to Ellis and He's (1999) study of incidental acquisition of English word

meaning that found that the group with premodified input scored 6.78 out of 10 or 67.8% on the comprehension test. The next section presents the results obtained by the explicit group on the comprehension test.

4.3.1.3 The effect of explicit vocabulary teaching and learning on the comprehension scores of the explicit group.

This section presents the results of the comprehension test taken by the explicit group members after explicitly learning vocabulary from the enhanced reading text. First, the section shows the raw scores, and then presents the descriptive statistics before comparing the results with those of previous studies. The results obtained by the explicit group members on the comprehension test are presented both in Table 9 below and in narrative form as shown next. The presentation follows the same structure as that of the results of the implicit group subjects displayed in the previous section, starting with a table of the raw scores followed by a detailed description and the statistics.

Table 10: *Comprehension Scores of the Explicit Group Subjects*

Explicit Group: Comprehension scores (out of 50)					
Case	Scores	Case	Scores	Case	Scores
1. Liz	17	14. Hilbert	23	27. Jennifer	22
2. Herbert	12	15. John	22	28. Daniel	19
3. Cecilia	16	16. Patrick	9	29. Rebecca	21
4. Jodi	25	17. Justin	24	30. Becky	8
5. Murielle	19	18. Peter	14	31. Carlos	9
6. Shirley	8	19. Adrian	11	32. Nicolas	10
7. Adam	21	20. Paul	17	33. Kara	8
8. Kevin	18	21. Lee	22	34. Norma	16
9. Sylvia	24	22. Nate	17	35. James	8
10. Tricia	18	23. Samuel	9	36. Ronald	7
11. Kathleen	7	24. Martin	2	37. Helen	10
12. Alan	20	25. Alicia	11	38. Jeff	13
13. Thomas	5	26. Riana	20	39. Briana	6

One subject obtained the highest score, 25 points out of 50 on the comprehension test, while 3 others scored 24 points each. Only 1 subject obtained the lowest score of 2 out of 50, and this specific result can be described as an outlier due to the fact that the next lowest score was 5 out of 50 or one tenth of the full score. In table 10 above, the scores were mostly spread between 5 and 25 without an important concentration at any level apart from the mode of 8 points obtained by 4 participants in the group. This mode for the comprehension scores in the explicit condition is in fact too low as compared to that of the implicit group situated at 13 points. However, the overall descriptive statistics shown below provides more clarity on the distribution of the scores that looks somewhat better when compared to the overall results of the implicit group.

4.3.1.4 Descriptive statistics of the scores of the explicit group on the comprehension test.

This part of the section presents the descriptive statistics of the scores obtained by the explicit group members on the comprehension test that was taken immediately after the experimental treatment.

Table 11: *Comprehension Test Scores of the Explicit Group*

Explicit group	N	Range	Minimum	Maximum	Mean	Mode	Std. Error of mean	Std. Deviation	Variance
Comprehension Test Scores	39	23.00	2.00	25.00	14.56	8.00	.126	6.26	39.23

$p < .05$

In terms of comprehension, the results obtained by the explicit group subjects shows that the scores are scattered between 2.00 points at the lower end and 25.00 at the higher end with a range of 23 points. The mean obtained by the explicit group is 14.54 (M=14.56) with a significance level of .097 at the $p < .05$, while the mode is 8 points. The standard deviation of the scores is at 6.25 (STD= 6.26) and the standard error of mean at .126 (SEM= .126). The significance level of the test was set at $p < .05$. This result shows that the means of the comprehension scores obtained by individual subjects in the explicit group were not dispersed too far away from each other in value. The reading text appeared to be easier to understand for the explicit group members than for

the implicit group members despite the fact that the explicit group members were not instructed to comprehend the text, but rather to learn the vocabulary items highlighted in the reading text. The group means and the difference of value between the lowest and the highest grades were not very large. The results obtained by the explicit group subjects were of average value and with less dispersion as shown by the variance of 39.23. This result tends to show that the level of difficulty of the text was not as high as it was for the implicit group (Sanko, 2006).

4.3.1.5 Performance difference between the implicit and explicit groups on the comprehension test.

This section presents the combined descriptive statistics of the scores achieved by the two groups as shown in Table 12 below and discusses the results.

Table 12: *Comprehension Test Scores of the Implicit and Explicit Groups.*

	N	Range	Minimum	Maximum	Mean	Mode	Std. Error of mean	Std. Deviation	Variance
Comprehension Test Scores	(Implicit) 39	24.00	4.00	28.00	13.89	13.00	.144	7.16	51.34
	(Explicit) 39	23.00	2.00	25.00	14.56	8.00	.126	6.26	39.23

$p < .05$

A comparison of the group means obtained by the implicit and the explicit groups on the comprehension test reveals that the mean performance achieved by the explicit

group members ($M=14.56$), and the one obtained by the implicit group members ($M=13.89$) were not very different. Both groups in this study did not do very well as most of the individual scores were situated around or below 50% of the maximum score. The two groups performed at a relatively similar level. Even the efforts of the explicit group to learn more of the vocabulary words did not produce a significant difference in the results obtained on the comprehension test. The difference between the two mean scores is a bare 0.67 points, a number that cannot be described as significant. The difference has the significance level of .687 at the $p < .05$ as visually represented in the figure shown below.

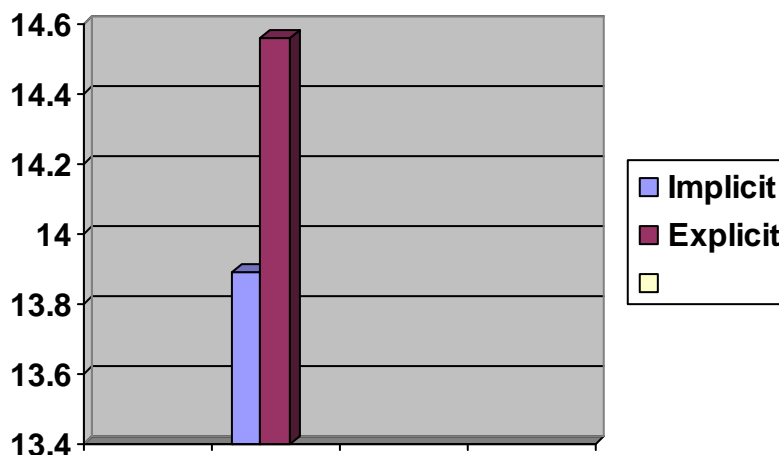


Figure 8: *Comprehension Test Scores of the Implicit and Explicit Groups*

The above results show that on a reading comprehension task, both the implicit and explicit instructions do not have a significant difference on the comprehension test.

4.3.1.6 Gloss access patterns of the two groups.

According to Giora (1997), comprehension is controlled by the degree of saliency of the referent metaphor. In Giora's (1997) theory, he refers to saliency as depending on factors such as supportiveness of preceding sentence context and goodness and/or familiarity of the metaphor or the context. The level of saliency provided to the target words in the forms of highlighting and additional enhancements reinforced the constraint on the explicit group to access enhancements for every target word but did not help to make a difference in the results, except on the immediate retention test. This difference also ultimately faded away when the subjects were tested later for delayed retention. According to Watanabe (1997), readers prefer textual annotations over pictorial one because text is easy to use and can clarify both abstract and concrete notions better than images. However, the textual glosses that appear to generally provide enough information to clarify what a word or expression means, without requiring further information did not help the explicit group to retain it gain longer. On the contrary, Mayer (2001) favors a combination of many annotation types, textual graphic and audio, but that more so applies in a multimedia environment where the different media are used simultaneously. When the enhancements can be serially retrieved as is the case in this study, with one enhancement at a time after another, it is more likely that when a selected gloss can provide information sufficient to help understand the unknown word clearly enough. In that case, the subject just proceeds to the next target word after realizing that the word in hand is already understood. Below is a summary of the distribution of gloss choice in the two conditions.

Table 13: Comparative gloss selection patterns of both groups

	Implicit group		Explicit group		Percentage difference/ dominant group
	Frequency	Percent	Frequency	Percent	
Text only	1540	62.6	1823	74.2	11.6% Expl. group
Graphic only	785	31.9	126	5.1	26.8% Impl. group
Audio only	29	1.3	22	.9	.4 % Impl. group
Text & graphic	3	.1	110	4.5	4.4% Explicit group
Text & audio	80	3.3	19	.8	2.5% Implicit group
Text, audio & graphic	18	.8	5	.2	.6% Impl. group
No information	2	.0	1	.0	0.0001% Impl.

The next section represents the central focus of the study and presents the results of the immediate and the delayed retention tasks obtained by the implicit and the explicit group members as guided by research question #2

4.4 Research Question # 2

What is the effect of the type of teaching of vocabulary on retention?

- 2) What is the effect of implicit and explicit teaching on retention?
 - a) What is the effect of implicit teaching on immediate retention?
 - b) What is the effect of explicit teaching on immediate retention?
 - c) What is the effect of implicit teaching on delayed retention?
 - d) What is the effect of explicit teaching on delayed retention?

4.4.1 The effect of implicit and explicit teaching of vocabulary on immediate retention.

This section presents the results of the two vocabulary retention tests taken by the subjects immediately after the experimental treatment and taken three and a half weeks later. First, it provides the raw scores of the immediate retention test achieved by the implicit group followed by the descriptive statistics, an explanation, and a comparison of the results to those of previous studies. Next, it gives the same detailed information on the results obtained by the explicit group members. Immediate retention describes the short-term retention of the new vocabulary items as they were assessed immediately at the end of the treatment session as shown in Table 14 in the following parts.

4.4.1 Immediate retention scores of the implicit group.

Table 14 below shows the results of the test of vocabulary retention taken by the subjects in the implicit group immediately at the end of the experimental treatment. All 39 subjects provided valid data on the immediate retention test. Table 14 lists the individual subjects as cases, and shows in front of each, the raw scores obtained as a result of taking the immediate posttest intended to measure the level of retention of new vocabulary words or phrases that they encountered in the text. The figures presented in the table represent each individual subject's score out of a maximum of 65 points.

Table 14: *Immediate Retention Scores Obtained by the Implicit Group Members*

Implicit Group: Immediate retention scores (out of 65)					
Case	Scores	Case	Scores	Case	Scores
1. Alexander	32	14. Christine	20	27. William	25
2. Jimmy	30	15. Tony	21	28. Kimberly	20
3. Michael	17	16. Erin	28	29. Eugene	20
4. Alfred	20	17. Brenda	25	30. Angelina	14
5. Jose	30	18. Zaynab	25	31. Amy	21
6. Ashley	29	19. Martha	33	32. Carol	25
7. Austin	19	20. Aaron	18	33. Gary	15
8. Elvis	23	21. Pablo	24	34. Therese	21
9. Sara	20	22. Trenton	32	35. Noelle	23
10. Joseph	24	23. Aaron	25	36. Travis	21
11. David	23	24. Emily	23	37. Jeremy	24
12. Bernice	20	25. Joyce	24	38. Adriana	24
13. Blake	15	26. Avery	19	39. Kirk	20

As can be seen in Table 14 above, none of the subjects obtained the highest score of 65 points, and none of them even reached 50% of the full score, which suggests that the text may have been very difficult. At the higher end of the performance on the immediate retention task, only one (1) subject scored 33 points, and 2 others scored 32 points each. The lowest score was 14 and the next lowest was 15 points. Globally, 14 subjects scored between 14 and 20 points out of 65 while 22 others scored between 21 and 30 points, and 3 more scored between 31 and 33 points. The overall results suggest that the chosen text could have been difficult beyond the target items. The results show that the implicit group members did not perform at the same level as the explicit group members, as was hypothesized at the onset of the study. These results also reflect Hulstijn et al.'s (1996) assertion that incidental vocabulary learning during reading does indeed

take place but only incrementally, and in small quantities, and that even multiple encounters often fail to produce retention. Not surprisingly, these results appear better than what was reported by Hulstijn's (1992) study in which only 7.69 % of the target words retained after a single encounter and without prompts. Dupuy and Krashen's (1993), Day, Omura, and Hiramatsu's (1991), and Horst et al.'s (1998) results reported approximately 20% of the target words retained. The descriptive statistics that summarize the findings are presented next in Table 14.

Table 15: *Descriptive Statistics of the Immediate Retention Scores of the Implicit Group*

Implicit group	N	Range	Minimum	Maximum	Mean	Std. Error of mean	Std. Deviation	Variance
Immediate Vocabulary Test Scores	39	19.00	14.00	33.00	22.87	.092	4.60	21.19

The above descriptive statistics on the immediate retention test show that the difference between the lowest and the highest scores or the range is of 19 points. The minimum and maximum scores obtained on the immediate retention test are respectively 14 and 33 points. The implicit group members obtained a group mean of 22.87 points ($M=22.87$) with a significance level of .271, a standard deviation of 4.6 ($STD=4.6$), and a standard error of mean of 3.34 ($SEM=3.34$) at $p < .05$. The group mean of 22.87 points represents only 35.18% of the full score. As the test items were graded at one (1) point each, the results represent a retention rate of 35.18 % of the target items. This result can

be described as moderate for a test taken immediately after the treatment. The variance between the extreme scores of 21.19% can be described as representing a wide gap, and thus a strong dispersion of the individual performances, as also shown by the range.

The next section presents the results obtained by the explicit group members on the immediate retention test.

4.4.2 Immediate retention scores of the explicit group.

Table 15 below presents the raw scores of the immediate vocabulary retention task obtained by the individual explicit group subjects. First, the section lists the raw scores in the table, matching the subjects with their achievement. Next, it provides the descriptive statistics for the whole group followed by discussion, explanations, and references to previous studies, both traditional and computer-assisted intervention.

Table 16: *Immediate Retention Scores of the Explicit Group*

Explicit Group: Immediate retention scores (out of 65)					
Case	Scores	Case	Scores	Case	Scores
1. Liz	22	14. Hilbert	37	27. Jennifer	24
2. Herbert	31	15. John	18	28. Daniel	27
3. Cecilia	21	16. Patrick	28	29. Rebecca	29
4. Jodi	31	17. Justin	19	30. Becky	24
5. Murielle	16	18. Peter	27	31. Carlos	20
6. Shirley	29	19. Adrian	20	32. Nicolas	36
7. Adam	29	20. Paul	31	33. Kara	20
8. Kevin	26	21. Lee	20	34. Norma	30
9. Sylvia	21	22. Nate	31	35. James	23
10. Tricia	32	23. Samuel	18	36. Ronald	36
11. Kathleen	23	24. Martin	34	37. Helen	13
12. Alan	24	25. Alicia	36	38. Jeff	22
13. Thomas	24	26. Riana	28	39. Briana	30

All the 39 subjects in the explicit group provided valid data on the immediate retention test, as was the case in the implicit group. The raw scores varied between 13 and 37 points. In this group, 5 subjects obtained over 50% of the full score. Globally, 9 subjects scored between 13 and 20 points, 20 subjects scored between 21 and 30 points, and 10 others scored between 31 and 37 points. In addition to the raw scores presented here, descriptive statistics are provided in the Table below. The statistics are then explained and compared to the results of previous studies.

Table 17: *Descriptive Statistics of the Immediate Retention Scores of the Explicit Group*

Explicit group	N	Range	Minimum	Maximum	Mean	Std. Error of mean	Std. Deviation	Variance
Immediate Vocabulary Test Scores	39	24.00	13.00	37.00	25.89	.120	5.98	35.79

$p < .50$

An analysis of the scores provided by the 39 subjects in the explicit group on the immediate vocabulary test shows that the explicit group members obtained a group mean of 25.89 ($M=25.89$), with a significance level of .016 (2-tailed) with a standard deviation of 5.98 ($STD = 5.98$), a standard error on mean of .120 ($SEM=.120$) and a variance of 35.79 at $p < .05$. This mean of 25.89 ($M = 25.89$) represents 39.96% of the total scores, and thus is less than 50% of the full score of 65 points. The range is also a large one with 24 points, approximately one third of the full score. In order to have a clearer perception of the difference between the performance achieved by the implicit and explicit group members, a side-by-side comparison of their respective scores is presented in the next

section. Hulstijn (2003); Hultijn et al. (1996); Herman (2003) report results that are partially lower and partially higher than those reported here. Sanko's (2006) study of ESL vocabulary reports a retention rate of 11.283 out of 13 on the immediate retention test, and a range of percentages comprised between 84.6% and 100% of the target words, an exceptionally superior result in comparison to the results of the present study.

According to Schmitt (2008), an explicit modality of teaching vocabulary is more important at the beginning levels: "At the beginning, an explicit approach which focuses directly on establishing the form–meaning link can be most effective [in teaching vocabulary]..." (p. 335).

Additionally, in a study of highly frequent vocabulary words recognition and comprehension on the computer Tozcu (1998) found that direct vocabulary instruction in highly frequent words of English on the computer does result in a significant increase in vocabulary knowledge which in turn has a significant positive effect on reading comprehension and speed of frequent word recognition. Both the highlighting and explicit instructions of vocabulary provided in the explicit condition had a positive effect on the subjects' achievement on the retention test as also graphically presented below.

4.4.3 Performance difference between the implicit and explicit groups on the immediate retention test.

A comparison of the scores obtained by the implicit and explicit group subjects on the immediate retention test is presented in Figure 9 below in the graphic display and then described in narrative form.

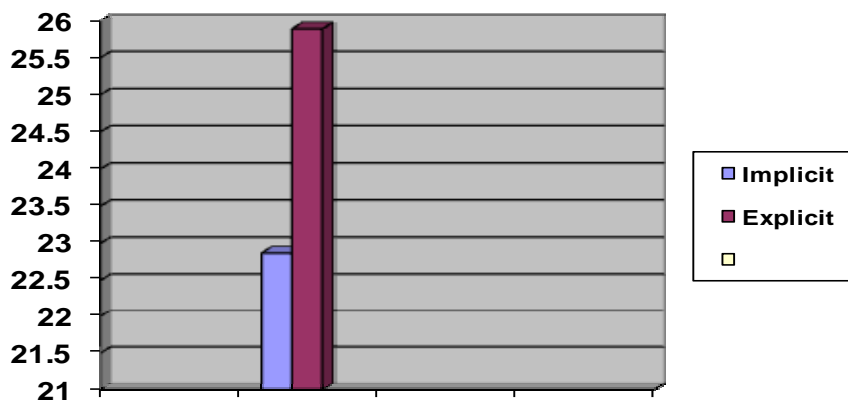


Figure 9: *Immediate Retention Scores by the Implicit and Explicit Groups*

Figure 9 above presents the average group scores achieved on the immediate retention test by the implicit and explicit groups. The two groups had different patterns of performance on the tests shared under the same circumstances. The explicit group performed significantly better than the implicit group on the immediate vocabulary retention test. At the upper level of the raw scores, the explicit group subjects obtained 4 points more than the implicit group members. These four (4) points represent 6.15% more gain than the implicit group. On average, the explicit group members also retained 3.02 points more than the implicit group average, the equivalent of 4.64% more vocabulary items than the implicit group members. The standard deviation of the mean was 5.98 (STD = 5.98) at $p < .05$. At the higher end of the results, the explicit group subjects scored 37 points, equivalent to 56.92% of the full score while the implicit group members scored 33 points, equivalent to only 50.76%.

As for the group means, the explicit group's 25.89 points are equivalent to 39.96% of the full score while the implicit group's 22.87 points represents only 35.18% of the total score. In both groups, the subjects' average performance did not reach 50% of the full score, and their levels of retention were at less than 50% of the total target words retained. However, the explicit group subjects performed better than the implicit group subjects on the immediate retention test as illustrated in Figure 10 above. Despite the fact that both groups took the same vocabulary test immediately after the experimental treatment and under the same conditions, the implicit mode of vocabulary teaching helped the subjects in that category to obtain only a moderate outcome on the immediate vocabulary test. These results support hypothesis 1b, according to which the explicit group members will outperform the implicit group members on the immediate vocabulary test that follows the treatment. In Sanko's (2006) study, the differences between the results of the incidental group (implicit) and the intentional group (explicit) are similar to those of the present study. In the incidental condition, the experimental group scored 8.175/13 on the immediate test and 7.833/13 on the delayed test while in the intentional condition, the subjects scored 11.283 out of 13 on the immediate and 9.75 out of 13 on the delayed tests. The results confirm Paribakht and Wesche's (1997) assertion according to which an explicit modality supplemented with enhancements works better than reading alone.

4.4.4 The effects of implicit and explicit teaching of vocabulary on delayed retention.

This section of the results separately reports the scores obtained by the implicit and explicit group members on the delayed retention test taken by the subjects in the two groups three and a half weeks after the experimental treatment, the recall protocol and the immediate retention test or first posttest.

4.4.4.1 Delayed retention scores of the implicit group.

This section of the study reports the results of the delayed or long-term retention test taken by the subjects three and a half weeks after the experimental treatment without any formal review of the treatment within the time between the two activities. As a response to research question number two that focuses on the effect of implicit and explicit teaching of vocabulary on delayed retention of the target vocabulary items, this section presents the results, first as raw scores, then as statistically analyzed, and finally as compared to each other and previous studies.

Table 18 below reports the raw scores obtained by the implicit group subjects on the delayed retention test, and then it presents the related descriptive statistics.

Table 18: Delayed Retention Scores by the Implicit Group

Case	Scores/65	Case	Scores/65	Case	Scores/65
1. Alexander	20	14. Christine	15	27. William	15
2. Jimmy	18	15. Tony	17	28. Kimberly	17
3. Michael	12	16. Erin	14	29. Eugene	18
4. Alfred	15	17. Brenda	14	30. Angelina	10
5. Jose	25	18. Zaynab	20	31. Amy	16
6. Ashley	18	19. Martha	22	32. Carol	22
7. Austin	16	20. Aaron	15	33. Gary	11
8. Elvis	19	21. Pablo	17	34. Therese	15
9. Sara	17	22. Trenton	18	35. Noelle	20
10. Joseph	24	23. Aaron	22	36. Travis	18
11. David	20	24. Emily	20	37. Jeremy	18
12. Bernice	20	25. Joyce	16	38. Adriana	21
13. Blake	13	26. Avery	20	39. Kirk	15

With the delayed vocabulary retention task, all 39 subjects in the implicit group provided data. The scores obtained by the individual subjects varied between 10 and 25 points. Thirty-three (33) subjects scored between 10 and 20 points, and the six others scored between 21 and 25 points. Generally, the scores obtained on the delayed vocabulary retention task were low in comparison to the immediate vocabulary retention task results due to the loss of retention over the period between the two posttests. The descriptive statistics are presented in Table 19 and the paragraph shown below.

4.4.4.2 Descriptive statistics of the delayed retention scores of the implicit group.

This table reports the descriptive statistics of the results obtained by the implicit group on the delayed retention test. Next, it provides a detailed explanation of the

changes observed in the results before comparing them to the results in retention obtained by previous studies of vocabulary acquisition.

Table19: *Descriptive Statistics of Delayed Vocabulary Scores of the Implicit Group.*

Implicit group	N	Range	Minimum	Maximum	Mean	Std. Error of mean	Std. Deviation	Variance
Delayed Vocabulary Test Scores	39	15.00	10.00	25.00	17.61	.067	3.33	11.11

$p < .05$

As is presented in Table 18 above, the analysis of the data provided by the implicit group on the delayed vocabulary retention test shows that the range was positively reduced to 15 points, the lowest score remained unchanged at 10 points, and the maximum score fell to 25 points from the levels achieved on the immediate retention test. The implicit group members obtained a mean score of 17.61 ($M = 17.61$), equivalent to 27.09% of the full score as opposed to the 35.18 % score they achieved on the immediate test. The standard deviation of the means was 3.33. The vocabulary gain of the implicit group dwindled by 5.26 points equivalent to 8.09 % of the full score between the two tests. The mean score of the group fell from the 22.87 points to only 17.61 and the level of variance from 21.19 to 11.11. The significance level of the test was set at $p < .05$. The maintenance of the group mean at 17.61 out of the original 22.87 shows that 76.34% of the new vocabulary retained at the end of the immediate vocabulary test was kept in mind at least up to three and a half weeks, up to the delayed vocabulary retention assessment. This level of retention shows that 8.09 % of the initially acquired vocabulary

was forgotten before the delayed retention task. The analysis of variance shows that the level of retention between the immediate and delayed retention in the implicit condition is statistically significant for $F 2.768$, $df=14$ significant at $p < .05$ and that more than half of the retention is explained by the implicit teaching condition based on the value of $R = .573$ and $r^2 = .329$. This supposes that the level of retention in the implicit condition is significantly explained at 33% by the implicit teaching condition, which is considerable, and thus, the implicit condition lead to the recorded degree of long-term retention as specified by the time elapsed between the two posttests. A look at the results presented in Table 18 above supports Laufer and Hulstijn's (2001) Involvement Load Hypothesis as the results of the delayed retention task did not regress as much as did those of the explicit group. It also proves that the gains of the implicit group members were solid and most of the items retained were firmly committed to memory in a way that favors longer retention. Not only had the intakes of the subjects gone from working memory to short-term retention but most of it transferred to long-term memory. The results of the implicit group consistently show more durability and reflect similar findings by Scott (1989) who investigated the implicit teaching of grammar at an intermediate French class and found that the implicit group participants who focused on the content clearly understood and remembered numerous details, even long after the research experiment was over. However, Scott (1989) cautions that there is a need of further experimental research to define the theory and practical application of explicit and implicit teaching strategies as his study was exclusively carried out in the classroom setting. By striving to understand the meaning of the text and using the learning strategies of their choosing and focusing

on aspects of interest to them, the subjects exerted deep processing of the information. They engaged very deeply into the selected parts of the activity as they tried to make sense of the text. This deep involvement and this deep processing of the information at hand created stronger memory traces and solidified their gains into long-term memory. As Hulstijn et al. (1996) insist that deep elaboration on the meaning leads to retention, Craik and Tulving's (1975) Depth of Processing as well as Laufer and Hulstijn's (2001) also support the result as the subjects in the implicit condition had to rely on their creativity and choice, and compensate for strategies and processes to understand. They ultimately did conserve their gain longer than the subjects in the explicit condition.

According to Herman's (2003) study, the control group experienced a decline of 21% in mean performance between posttests as a consequence of the simple memorization of paired-associates and thus a lesser depth in processing. Apparent here are also Hulstijn's (1992) deep mental effort and Salomon's (1983) theory of mental effort-dependent success according to which the degree of retention is related to the degree of mental effort made in the learning process. The above theories can be used to justify that the implicit group members used more mental efforts on the self-selected target words that they retained even though the time spent in reading was in average shorter than the time spent by the explicit group members. As retention is mental effort-dependent as implied by the above theories, it can be supported that the implicit group members who retained longer actually made more mental efforts as well.

4.4.4.3 Delayed retention scores of the explicit group.

This part of the section reports the raw scores obtained by the explicit group members. Next, it presents the related descriptive statistics and adds the studies and theories related to the findings.

Table 20: *Delayed Retention Scores obtained by the Explicit Group members*

Explicit Group: Delayed retention scores (Out of 65)					
Case	Scores	Case	Scores	Case	Scores
1. Liz	13	14. Hilbert	35	27. Jennifer	24
2. Herbert	10	15. John	22	28. Daniel	23
3. Cecilia	16	16. Patrick	18	29. Rebecca	25
4. Jodi	30	17. Justin	19	30. Becky	13
5. Murielle	14	18. Peter	12	31. Carlos	16
6. Shirley	18	19. Adrian	13	32. Nicolas	12
7. Adam	30	20. Paul	17	33. Kara	11
8. Kevin	21	21. Lee	12	34. Norma	27
9. Sylvia	15	22. Nate	28	35. James	9
10. Tricia	26	23. Samuel	8	36. Ronald	10
11. Kathleen	18	24. Martin	21	37. Helen	9
12. Alan	19	25. Alicia	15	38. Jeff	8
13. Thomas	10	26. Riana	25	39. Briana	9

The data provided in Table 19 above obtained by the 39 subjects in the explicit condition show that at the delayed retention level, the lowest and the highest scores obtained by the explicit group subjects were respectively 8 and 35 points. Both extreme scores did change: the lowest fell from 13 to 8 points and the highest from 37 to 35 points. The gap between the two extreme scores also widened from 24 to 27 points. The gaps noted represent losses of 3 points at the upper end of the vocabulary gain and 3 points at the lower level. Globally, three (3) subjects scored between 8 and 10 points,

eighteen (18) scored between 11 and 20 points, twelve (12) others scored between 21 and 30 points, and one (1) scored 35 points. In addition to this summary of the raw scores obtained by the explicit group subjects on the delayed vocabulary retention test, the descriptive statistics presented in Table 21 below provide more information on the results.

A comparison of the results obtained by the explicit group members on the immediate and delayed retention tests shows that the explicit group members lost a lot of their vocabulary gains between the two tests. This loss confirms the hypothesis according to which the explicit group members will gain more vocabulary immediately but an important part of this gain will fade away.

4.4.4.4 Descriptive statistics of the delayed retention scores of the explicit group.

This part of the study reports the descriptive statistics of the scores and the detailed effects of the explicit modality of teaching vocabulary on the subjects' performance levels on retention of the newly learned vocabulary items.

Table 21: *Descriptive Statistics of the Delayed Vocabulary Scores by the Explicit Group*

Explicit group	N	Range	Minimum	Maximum	Mean	Std. Error of mean	Std. Deviation	Variance
Delayed Vocabulary Test Scores	39	27.00	8.00	35.00	17.46	.14142	7.010	49.140

$p < .05$

An analysis of the scores obtained by the 39 explicit group subjects on the delayed vocabulary retention test revealed that the group mean score on the delayed vocabulary test is 17.46 ($M = 17.46$), equivalent to 26.86% of the full score of 65 points. The range widened from 24 to 27 points, and the variance from 35.79 to 49.14. The lowest score further fell from 13 to 8 points and the highest declined from 37 to 35 points. The standard deviation and the standard error of mean respectively increased from 5.98 to 7.01 and from 0.12 to 0.14.

As for the difference between the group means of the immediate and delayed vocabulary tests, there was a decline of 8.43 points from 25.89 to 17.46 between the two tests. This difference represents a loss of 12.96% of the primary acquisition accounted for with the immediate retention task, compared to a decline of only 8.09% in the implicit condition. The increase in the standard deviation from 5.98 to 7.01 suggests that, in the delayed vocabulary performance, the means obtained by the individual subjects were scattered over a greater range than in the immediate vocabulary test and thus a greater level of difficulty on the task. In the explicit condition however, the analysis of variance with the significance level set at $p < .05$ revealed that the level of retention recorded as long-term retention between the immediate and delayed tests showed a lack of statistical

significance with a value of $F .942, df14$ at $p < .53$. It is non-significant difference and slightly negative relation on delayed retention as verified by the value of $R = -0.105$ and $r^2 = .011$. This supposes that the explicit teaching condition did not have a significant positive effect on the degree of long-term retention in the explicit condition. It only explains 1% of the level of maintenance of the retention.

The levels of performance in the explicit and implicit conditions were very different as seen in the two previous sections of the result report, and this is further clarified below in a direct comparison of the results obtained by the two groups.

4.4.4.5 Performance difference between the implicit and explicit groups on the delayed retention test.

This section compares and contrasts the descriptive statistics of the scores obtained by the two groups on the delayed retention test and completes it with a description of the graphic representation of the scores.

Table 22: *Comparative Descriptive Statistics of the Delayed Vocabulary Scores of the Implicit and Explicit Groups*

	N	Range	Minimum	Maximum	Mean	Std. Error of mean	Std. Deviation	Variance
Delayed Vocabulary Test Scores	Implicit 39	15	10	25	17.61	.067	3.33	11.11
	Explicit 39	27	8	35	17.46	.14142	7.01	49.14

$p < .05$

When the means of the delayed vocabulary retention test of the two groups are presented side by side, the difference between the means appears smaller than on the immediate retention test, and the implicit group, not the explicit group, shows to have done better but insignificantly by a 0.15 points difference over the explicit group. The lead of the explicit group on the immediate retention test did not hold up to the delayed retention test. Rather, the implicit group took the lead even though the difference is very small and statistically insignificant as is detailed below. The retention through the implicit modality of teaching vocabulary lasted longer for a greater number of items than the retention through the explicit modality.

The statistics show that, by the end of the three and a half weeks, the explicit group maintained on average 17.46 points or 67.43 % of the immediate gain of vocabulary, while the implicit group maintained its gain at 17.61 points or 77.00% of the initial gain over the same period of time at the significance level of $p < .05$. This level of retention puts the explicit group members behind the implicit group members who originally retained fewer words but had a firmer type of retention that was mostly maintained at least until the end of the three and a half weeks between the two posttests. The difference in performance between the implicit and explicit groups amounts to a non significant level of .687 (2-tailed) for the comprehension scores, and a non-significant level of .905 (2-tailed) for the delayed retention. However, the difference in immediate retention is significant at .021 (2-tailed). In reading time, the difference between the two groups is very significant at .000 (2tailed) as well.

Ultimately, the analysis of the descriptive statistics shows that the subjects in the explicit group gained more vocabulary items than the implicit group members on the immediate vocabulary test. But, over time, a lot of the gain faded away. For the implicit group members, however, although they only moderately gained the new vocabulary items, only a minimal amount faded away over the three and a half weeks period that lapsed between the two tests. The implicit group members maintained a higher percentage of the vocabulary items that they gained with the treatment. A Paired Samples T-Test comparing the delayed retention scores of the implicit and explicit groups also reveals a Standard Deviation of 3.376 (SD=3.376) and a Standard Error of Mean of .540 for the implicit group and a Standard Deviation of 7.100 (SD=7.100) and a Standard Error of Mean of 1.136 (SEM=1.136) and the confidence interval of the difference is -0.031 at $p < .05$. This is a negative relation of significance and confirms that the difference in delayed retention score between the implicit and explicit groups is not significant. Even though a difference exists between the scores of the two groups as measured with the delayed retention test, that difference of 0.7 points is not significant at all. These findings support the hypothesis 1c, according to which the implicit group members will retain moderately at first but will maintain most of their retention longer than the explicit group subjects. The subjects in the explicit group will primarily retain many more new vocabulary items than the implicit group subjects, but many of the retained items will be forgotten earlier than those of the implicit group subjects. According to a number of studies, deep processing (Craig and Lockhart, 1972; Craig and Tulving, 1975; Paivio, 1971, 1981; Scott, 1989; Baddeley, 1991; Herman, 2003; Plass and

Jones, 2005), deep mental efforts (Hulstijn 1992; Hulstijn et al., 1996; Scott, 1989), and deep involvement (Laufer and Hulstijn, 2001) a higher mental effort and a profound implication into an activity will lead to longer retention of the resulting vocabulary items acquired.

This performance difference between the two tests and for the two groups confirms hypothesis number 1 according to which the implicit group would not achieve higher scores right away on the immediate retention test, but would retain most of their vocabulary gains for a longer period of time. Waring and Takaki (2003) as quoted in Schmitt (2008) found stronger vocabulary gain and retention for recognition with 10.6 out of 25 word meanings recognized on the immediate posttest and 6.1 out of 25 word meanings recognized on the delayed posttest. As for the translation on the immediate and delayed posttests, only 4.6/25 and 0.9/ 25 words were translated on the immediate and delayed tests. The next section presents and discusses the summary of the findings.

4.4.5 Performance difference between the two groups on the delayed retention test.

The graph presented below shows the results of the comparison of the performance achieved by the implicit and explicit group members on the delayed vocabulary retention test. It shows how the two groups ultimately differ after taking the same test, under the same condition, but only three and a half weeks after working with the input on the computer. It is a very informative comparison as is detailed after the graph.

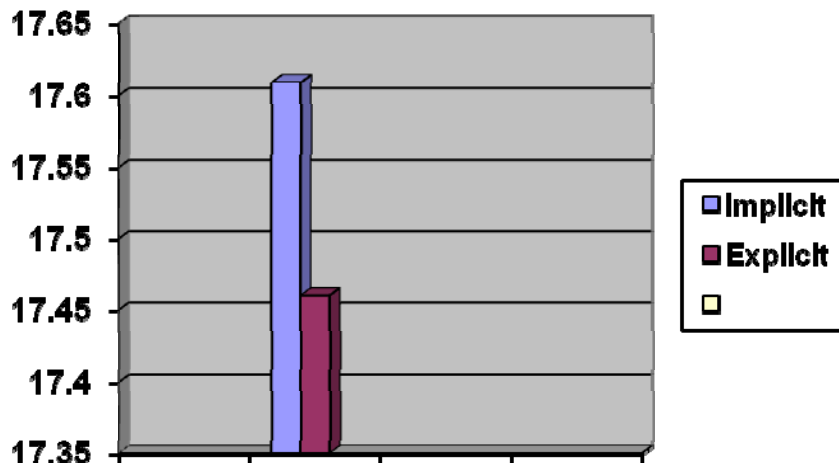


Figure 10: *Delayed Retention Scores of the Implicit and Explicit Groups*

The above graph reveals that the implicit group members have higher scores than the explicit group members while it was the reverse situation with the immediate vocabulary retention task. The group means score achieved by the implicit group members on the delayed task is 17.61 and that of the explicit group is 17.46. The implicit group members have a lead of 0.15 points over the explicit group on the delayed retention task. As presented in Figure 11 above, the order of high performance originally observed with the immediate retention task was reversed. The implicit group that was behind in both the comprehension and the immediate vocabulary retention scores pretty much at the same level and even had an insignificant edge over the explicit group on the delayed vocabulary retention task. In order to further highlight the difference between the results obtained by the two groups, the scores are presented side by side in numeric form in the next section.

4.4.6 Summary of the different test results.

This section summarizes the results of the three (3) tests taken by the subjects in the two groups. The results are shown side by side in Table 23 below in order to highlight the differences in the performance levels achieved by the subjects in the two (2) groups, and more comments are added.

Table 23: *Summary of the descriptive statistics of the different test results*

	N	Range	Minimum	Maximum	Mean	Std. Error	Std. Deviation	Variance
Comprehension Test Scores	Implicit (39)	24	4	28	13.89	.14	7.16	51.34
	Explicit (39)	23	2	25	14.56	.12	6.26	39.23
Immediate Vocabulary Test Scores	Implicit (39)	19	14	33	22.87	.09	4.60	21.19
	Explicit (39)	24	13	37	25.89	.12	5.98	35.79
Delayed Vocabulary Test Scores	Implicit (39)	15	10	25	17.61	.06	3.33	11.11
	Explicit (39)	27	8	35	17.46	.14	7.01	49.14

$p < .05$

As presented in Table 23 above, the results of this study show that the scored on the comprehension test and the immediate retention test fluctuate pretty much in the same direction, but not on the delayed retention test for which the results of the explicit group declined more dramatically than the implicit group. Overall, the results were not high enough on all the tests.

On the immediate vocabulary retention test, the explicit group scored better than the implicit group with a mean of 25.89 points statistically significant at $p < .021$ at the $p < .05$ for the explicit group and 22.87 for the implicit group. The explicit group performed better than the implicit group on the immediate retention test, a difference that is statistically significant between the two results on the immediate vocabulary retention test.

On the delayed vocabulary test, the difference between the results of the two groups was very limited. The explicit group that scored higher points on the immediate retention test lost more of its gain than did the implicit group. It fell behind the implicit group by 0.15 of mean points. One sign of the difference is that the scores of the implicit group had only a standard deviation of 3.33 while that of the explicit group was 7.01. The difference between the variance in the implicit group and explicit group performance was exceptionally larger than in all the other situations with 11.11 in the implicit condition and 49.14 in the explicit condition. This demonstrates a large level of disparity between the individual scores. The implicit groups' vocabulary gain was more stable and centered than that of the explicit group.

While the retention rate shown by the explicit group was higher than the retention rate achieved by the implicit group on the immediate retention test, the delayed vocabulary retention test that was the second in line did show reversed results as the explicit group members lost more from their initial gains than did the implicit group members. The level of performance of the explicit group members decreased dramatically while that of the implicit group only decreased moderately, keeping it

slightly above the result of the explicit group even though not in a significant way as graphically shown in Figure 11 below.

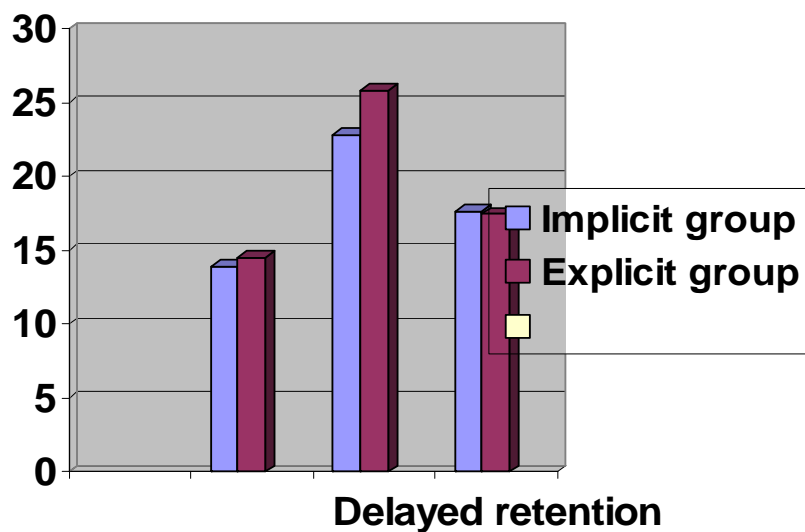


Figure 11: *Comprehension, Immediate and Delayed Retention Scores*

The next section presents the results of the correlation between motivation and achievement.

4.4.7 Intercorrelations between the experimental variables.

The intercorrelation analyses show interaction between the different variables at different levels. One group very significantly intercorrelates with other variables, another positively and yet another negatively. Table 24 shown below presents the intercorrelation coefficients between the experimental variables in the implicit condition.

Table 24: Intercorrelations in the implicit condition.

		1	2	3	4	5
1	CompTestScores	1	.153	.156	-.289	-.027
2	ImmTestScores	.153	1	.573(**)	-.181	.429(**)
3	DelTestScores	.153	.573(**)	1	-.079	.271
4	ReadTime	-.289	-.181	-.079	1	.126
5	MotiFren202	-.027	.429(**)	.271	.126	1

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

Table 24 above shows that comprehension positively correlates with immediate and delayed retention on the one hand, but does negatively so with motivation, and very negatively with reading time on the other. Immediate retention correlates very significantly with both delayed retention (.573**) and motivation (.429**) at the significance level of $p < .01$. This correlation shows that immediate retention on the one hand and long-term retention (3.5 weeks) and motivation on the other are very much associated through a very strong relationship. They may affect each other strongly and positively. Immediate retention is also positively but not significantly associated with comprehension, and rather negatively with reading time.

These intercorrelations suppose that the amount of time spent on reading is negatively associated with immediate retention and does not necessarily have a positive effect on immediate retention. Delayed retention, is very significantly associated with immediate retention, also fairly correlates (.271) with motivation and comprehension, but weakly (.126) and negatively (-.079) correlates with reading time. As for motivation, it

strongly and positively correlates with immediate retention, positively with delayed retention and reading time, but weakly and negatively with comprehension.

The different intercorrelations in the implicit condition can be interpreted in many different ways. Comprehension, immediate retention and delayed retention tend to have positive associations and thus positive influence on each other, especially between immediate and delayed retention, supposing that the level of immediate retention is associated with that of long-term retention in the implicit condition. The level of motivation also shows a significant relationship with immediate retention but seems not to positively influence the level of reading comprehension. All the other associations may be positive or negative but are not significant at the $p < .05$ level.

Table 25: Intercorrelations in the explicit condition

		1	2	3	4	5
1	CompTestScores	1	-.076	.599(**)	.623(**)	-.183
2	ImmTestScores	-.076	1	.406(*)	.051	-.042
3	DelTestScores	.599(**)	.406(*)	1	.610(**)	-.116
4	ReadTime	.623(**)	.051	.610(**)	1	-.323(*)
5	MotiFren202	-.183	-.042	-.116	-.323(*)	1

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

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

In the explicit condition, comprehension is strongly and significantly related to delayed retention (.599**) and reading time (.623**) but rather negatively and not

significantly with motivation (-.183) as well as to immediate retention (-.076). Immediate retention significantly correlates with delayed retention (.406*) but only weakly with reading time (.051) and also negatively with immediate retention. As for delayed retention, it very significantly correlates with comprehension and reading time (.610**) and significantly with immediate retention, but it negatively does so with motivation. Reading time very significantly correlates with comprehension and delayed retention and weakly with immediate retention, but negatively with motivation. In the explicit condition, motivation seems to only have negative correlations with the other variables at a variety of degrees.

With reference to the intercorrelations in the explicit condition described above, it can be suggested that length of reading time seems to be beneficial to comprehension and delayed retention in the explicit condition. Reading time strongly benefits comprehension and comprehension strongly benefits long-term retention as in a “triangular” relationship. Immediate and delayed retention also significantly interact, but not very strongly. In the explicit condition, motivation only has negative correlation with the other variables. It supposes that motivation may not be a predictor of retention and that retention may involve other processes or conditions. This also brings the question of whether the subjects accurately reported their levels of motivation, or rather expressed it but did not necessarily translate their levels of motivation into learning acts so that the expected effect would be met. The next section discusses the associations between motivation and vocabulary learning.

4.5 Research Question # 3

What is the correlation between learner motivation and vocabulary learning outcome?

Research question # 3 asks about the relationship between the levels of motivation of the learners and their levels of performance on the different tests. The questionnaire answers were coded and analyzed to classify the subjects according to their responses. The categories of nationality, gender, self-perception, and use of French have been disregarded as presenting too much information to this study, allowing a simplified distribution between the two groups and a balanced analysis. This section of the study presents the results of the comprehension test, immediate vocabulary retention test, and delayed vocabulary retention test by motivation group before presenting an overview of the highlights of the subjects' comments on a variety of aspects of the study. The correlation between the demographic variables and their effect on the subjects' achievement is assessed in terms of scores obtained on the different tests by the subjects.

4.5.1 Motivation categories and coding.

The responses provided by the subjects were converted into motivation types depending on the type of information they conveyed. A preliminary analysis of the answers to the questionnaire provided by the subjects was done to observe the exhaustive number of motivation types apparent in them in order to find out what types of motivations were implied in the responses. Four categories were noted based on the types of information provided. The responses provided by some subjects conveyed the idea that they were studying French based on their own pleasure. This group was classified in the

category of intrinsic motivation, defined by Malone and Lepper in Ng, E. (2010) in more simple terms as “what people will do without external inducement” (p. 234). The second category noted was based on the subjects’ justification of their study of French by the opportunities that it may provide, the possibility of leaving or working in France or in a French-speaking country in the future. This group was categorized as instrumental based on Husman and Lens in Husman et al (2004) who defines instrumental motivation as understanding the ways in which gaining competence in a task can help reach future goals. A third category is based on a combination of both and was labeled as intrinsic and instrumental. The fourth category was based on the reports by some subjects that they were taking only because it is required of them for fulfilling the foreign language requirement in order to be able to graduate from the university. This category was labeled as requirement category. The subjects in each category were described as a group. Both the requirement category and the instrumental category were classified as sub-categories of an extrinsic group as the motive of their inducement is primarily external to the subject. For this reason, the global category of extrinsic as opposed to intrinsic was not repeated. Even though instrumental motivation is based on decision by a subject to behave in a way that will favor the achievement of a goal or the avoidance of punishment or the like, it is primarily not inherent in the individual’s intention. Its concretization is external.

The categories discussed above have led to the creation of numerical codes that were used in the analysis of the data by SPSS. The codes were developed for each of the relevant items in the background questionnaire as follows:

Table 26: Motivation categories and coding

Content of the information provided	Assigned category	Numerical code
Combination of likes, job, and travel-related content information	Intrinsic and instrumental	1
Likes content information	Intrinsic	2
Job and travel-related content information	Instrumental	3
University requirement content information	Requirement	4
Major	Intrinsic	2
Minor	Instrumental	3

(The complete coding by questionnaire item is available in Appendix G)

4.5.2 Mean and standard deviations of the comprehension scores by motivation group in the implicit condition.

Table 27 shown below presents the results achieved on the comprehension test by the implicit group subjects and by motivation group. As the subjects in the implicit group reported a variety of reasons for studying French in FREN202, it is reasonable to ask whether they may achieve differently as well even though they received the same input, under the same conditions. The category N represents the number of subjects identified as having one of the motivation types listed for the subjects as detailed in chapter three. The second column presents the group means scores obtained by the different motivation type subjects and the last column shows the standard deviation of the means in each group. The level of significance in the test was set at $p < .05$. Under each table is a description of

the results obtained by the subjects with various types of motivation. At the end, the peculiarities of the results are highlighted.

Table 27: *Comprehension Scores by Motivation Group in the Implicit Condition*

Motivation type	Number	Mean	STD
Intrinsic & Instrum. Motiv.	17	13.52	7.69
Intrinsic Only Motiv.	8	14.62	6.30
Instrum. Only Motiv.	7	16.14	7.44
Requirement	7	11.71	7.82
Total	39	13.89	7.25

$p < .05$

The above distribution shows that 17 subjects had a combination of *intrinsic and instrumental motivation*, 8 had an *intrinsic only* type of motivation, 7 members had *instrumental only* motivation and 7 others did not have any kind of personally initiated motivation but were taking FREN202 because they were required to do so. The instrumental only group is the one that scored the highest on the comprehension test even though the result can be described as very poor performance as these subjects obtained a group mean of only 16.14 out of 50. The intrinsic only group scored a mean of 14.62, and the intrinsic and instrumental group scored 13.52 points. The requirement group scored the least. They obtained a group mean of only 11.71 out of 50. None of the results is statistically significant as they have the global significance level of .715 at the $p < .05$. In light of this result, it can be said that the motivation type labeled instrumental only is the one that is associated with better performance in comprehension in comparison to the other types. The interaction between the explicit teaching, different motivation groups, and comprehension is presented next.

4.5.3 Means and standard deviations of the comprehension scores by motivation group in the explicit condition.

Table 28 below reports the distribution of the explicit group members by motivation group and the results that they achieved on the comprehension test.

Table 28: *Comprehension Scores by Motivation Group in the Explicit Condition*

Motivation type/Comprehension (Explicit)	Number	Mean	STD
Intrinsic & Instrum. Motiv.	9	18.66	6.87
Intrinsic Only Motiv.	16	15.81	5.96
Instrum. Only Motiv.	10	11.40	4.16
Requirement	4	8.25	2.87
Total	39	14.56	6.34

$p < .05$

As represented in Table 28 above, on the comprehension test, the *intrinsic and instrumental* group did better with a mean of 18.66 ($M = 18.66$) when compared to the results of the other motivation types. The result, however, is not significant at all. Next, come the results of the *intrinsic only* group with a mean of 15.81 ($M = 15.81$) and that of the *instrumental only* group with 11.40 ($M = 11.40$). The *requirement* group is the one that did the worst with a mean of only 8.25 points ($M = 8.25$) out of the 50 points. These results indicate that explicit teaching of vocabulary appears favorable to the subject with a combined *intrinsic and instrumental* motivation type. However, this does not offer the possibility for praising the explicit modality of teaching vocabulary over the implicit one. The explicit modality does not even have a better association with people who take a course only as a requirement. The requirement group performed the worst with a mean

of only 8.25 out of the full 50 points even though the standard deviation was 2.87, certainly due to sample size. Overall, however, none of the motivation groups achieved a statistically significant score on the comprehension test.

4.5.4 Means and standard deviations of the immediate retention scores by motivation group in the implicit condition.

Immediate retention of the vocabulary is one of the main variables of the present study. As the group members also reported different types of motivation, it is important to note how this variable is associated with the results of the immediate vocabulary retention test. Table 29 below reports the distribution of the subjects across the different motivation types, the distribution of the group means, and the standard deviations within the particular groups.

Table 29: *Immediate Vocabulary Retention Scores by Motivation Group in the Implicit Condition.*

Motivation type	N	Mean	STD
Intrinsic & Instrum. Motiv.	17	20.88	2.95
Intrinsic Only Motiv.	8	22.37	6.84
Instrum. Only Motiv.	7	25.85	3.43
Requirement	7	25.28	4.38
Total	39	22.87	4.66

$p < .05$

Table 29 above shows that, in terms of immediate retention in the implicit condition, the results obtained by the motivation groups were very diverse. The instrumental only and requirement groups seem more positively associated with the

implicit teaching condition and had the respective means of 25.85 and 25.28. The intrinsic only group is the third positively associated with the implicit teaching condition with a group mean of 22.37 points. The *intrinsic and instrumental* motivation group scored the lowest group mean of 20.88 points out of the total 65 points.

Generally, all the motivation groups are influenced by the implicit teaching condition in a closely similar way. The standard deviations show that the means obtained by the *intrinsic and instrumental* group subjects had the least deviation compared to the other groups. The means obtained by the *intrinsic only* group members were the most scattered between the two extreme scores. The *instrumental only* and *requirement* groups scored better than the other motivation groups. In the implicit condition, one only group mean obtained in this motivation group is statistically significant. An analysis of variance of the scores showed that only the immediate retention scores present a significance level of .040 at $p < .05$. The Between Groups F value is 3.076, $df(33, 3)$. The mean scores obtained by all the other motivation groups were not significant. The comprehension, delayed retention and the reading time scores presented the respective significance levels of .715; .341; and .146. The next section discusses the descriptive statistics of the immediate retention task by motivation group in the explicit condition.

4.5.5 Means and standard deviations of the immediate retention scores by motivation group in the explicit condition.

Table 30 below presents the complete distribution and the details are described afterward. Nine subjects had a combination of intrinsic and instrumental type of

motivation, sixteen had instrumental only motivation, ten had instrumental only motivation, and four subjects had requirement as their only source of motivation to learn French in a FREN202 class.

Table 30: *Immediate Retention Scores by Motivation Group in the Explicit Condition*

Motivation type/Imm.Retention	N	Mean	STD
		Intrinsic & Instrum. Motivation	9
Intrinsic Only Motivation	16	25.00	5.37
Instrum. Only Motivation	10	26.50	7.94
Requirement	4	25.50	3.69
Total	39	25.89	6.06

$p < .05$

On the immediate vocabulary test, all the different motivation groups did well. The results show that there is very little difference between the means obtained by the various groups. The intrinsic and instrumental groups outperformed all the others with a group mean of 27.00 points. Both the instrumental only and requirement groups performed moderately and differently; respectively with a mean of 26.50 and a mean of 25.50, all at the $p < .05$ significance level. An ANOVA shows that the scores of the immediate retention task by motivation in the explicit group have a significance level of .008 at the $p < .05$. Thus motivation is associated with a significant result in immediate retention in the explicit condition. Nevertheless, it is worth noting that the results obtained by the requirement group members were not far from each other. They had closely similar Standard Deviations, suggesting that the level of difficulty was almost even for all the subjects in the explicit group. The differences between the results

obtained by the different groups are not great, as the results are very close to each other but, the global mean for the group that is 25.89, represents a 39.96% mean score significant at the $p < .05$ level. The standard deviation of the requirement group shows that the difference between the subjects in that category was not as big as the deviation from the group mean in the other motivation groups but, due to the limited number of cases, comments of an attempt to generalization on this level of performance cannot be easily made. Thus, the subjects who fall into the category of intrinsic and instrumental motivation may be associated with some level of ease in completing the delayed posttest than all the other subjects.

4.5.6 Means and standard deviations of the delayed retention scores by motivation group in the implicit condition.

As the most important variable in the present study, delayed retention is closely examined in many different ways. In this section, the results of the delayed vocabulary retention test obtained by the explicit group members are presented in Table 31 below by motivation group. Among the thirty-nine (39) subjects, seventeen (17) had a combination of intrinsic and instrumental motivation, eight (8) had intrinsic only motivation type, seven (7) had instrumental motivation, and another group of seven did not have other sources of motivation different than being required to do so by their institution. Beyond the presentation of the full distribution, additional descriptions are provided.

Table 31: *Delayed Retention Scores by Motivation Group in the Implicit Condition*

Motivation type	Number	Mean	STD
Intrinsic & Instrum. Motiv.	17	16.76	3.28
Intrinsic Only Motiv.	8	17.12	3.79
Instrum. Only Motiv.	7	19.14	3.93
Requirement	7	18.71	2.13
Total	39	17.61	3.37

$p < 0.5$

When presented by motivation group, the results of the delayed retention test obtained by the implicit group members show that the *instrumental only* group performed better than the other groups with a group mean of 19.14 points. The *requirement* group scored the second largest mean with 18.71 points. The *intrinsic only* and the *intrinsic and instrumental* groups rank third and fourth with the respective group means of 17.12 points, and 16.76 on the delayed retention test at the $p < .05$ level. The global performance of the group can be described as low in this condition and by motivation type and very far from statistical significance. The level of significance shown by the ANOVA is only .341 at the $p < .05$ level. Table 31 in the summary shows the overall scores.

4.5.7 Means and standard deviations of the delayed retention scores by motivation group in the explicit condition.

The results of the delayed retention test obtained by the explicit group members and by motivation group are reported in Table 32 that follows, and described afterward.

Table 32: *Delayed Retention Scores by motivation Group in the explicit condition.*

Motivation type/Delayed retention	Number	Mean	STD
Intrinsic & Instrum. Motiv.	9	22.44	6.04
Intrinsic Only Motiv.	16	18.18	7.48
Instrum. Only Motiv.	10	14.60	5.44
Requirement	4	10.50	1.73
Total	39	17.46	7.10

$p < 0.5$

On the delayed vocabulary test in the explicit condition, the *intrinsic and instrumental* group did remarkably and markedly the best with a mean of 22.44 points ($M = 22.44$), followed by the *intrinsic only* group with 18.18 points and then by the *instrumental only* group with 14.60 points. The *requirement* group again did the worst with a mean of only 10.50 points, scoring even less than half of the 22.44 points scored by the intrinsic and instrumental group at the $p < .05$. The effect of the explicit teaching methodology is very strong and positive on the combined *intrinsic and instrumental* motivation group with a significance level of .012 at the $p < .05$, while it appears to be strongly negative for the *requirement* group on the delayed retention test. The *intrinsic and instrumental* group subjects in the explicit group were better favored by the explicit modality than all the other groups. The *intrinsic only* group, the *instrumental only* group, and the *requirement* group follow in this order. Here again, the requirement group appeared to be seriously behind all the other groups and scored a markedly low average on the test, suggesting that the students who take the class only as a requirement may not retain the vocabulary items that they learn over a longer period time.

4.5.8 Summary of the change of the scores in the two conditions.

As a summary of all the different levels of performance achieved by all the motivation groups in the two modalities of implicit and explicit teaching of vocabulary, the two tables below present the full distributions of the results obtained on all the tests by all the motivation groups involved. This representation helps to note the intra-test and inter-test variations that occurred between the tests and show the differences that are related to both the experimental and demographic variables. The comparison of the loss between the delayed retention scores shows that in both implicit and explicit groups by motivation, the difference in score is significantly negative for a t value of -72.959, df 3 and a significance level of .000 (2tailed) for the cumulated implicit group scores, and a value t of -1.400, df 3 and a significance of .256 (2-tailed) for the cumulated scores in the explicit group. The confidence interval of the difference was set at 95% ($p < .05$).

Table 33: *Results by Motivation Group on all the three Tests in the Implicit Condition*

Implicit	N (39)	CompTestScores	ImmTestScores	DelTestScores	Loss
Intrinsic & instrumental	17	13.52	20.88	16.76	4.12
Intrinsic only	8	14.62	22.37	17.12	5.25
Instrum. only	7	16.14	25.85	19.14	6.71
Requirement	7	11.71	25.28	18.71	6.57

$p < .05$

Table 34: *Results by Motivation Group on all the three Tests in the Explicit Condition*

Explicit	N (39)	CompTestScores	ImmTestScores	DelTestScores	Loss
intrinsic & instrumental	9	18.66	27.00	22.44	4.56
Intrinsic only	16	15.81	25.00	18.18	6.82
Instrum. only	10	11.40	26.50	14.60	11.9
Requirement	4	8.25	25.50	10.50	15

$p < 0.5$

As shown in the two tables above, the comparison of the results obtained by the two groups ultimately confirms the presence of a number of regularities. For both the implicit and explicit groups, the group means decreased between the immediate and the delayed vocabulary retention tests. In both conditions, the requirement group had been markedly behind all the other motivation groups.

It is apparent in the two tables above that the instrumental only and requirement only groups are the ones that lost more of their vocabulary gains between the immediate and the delayed vocabulary tests. The intrinsic only groups only moderately lost from their gains when compared to the instrumental and requirement groups. The subjects with a combined intrinsic and instrumental motivation were those who lost the least of their vocabulary gains between the two vocabulary posttests. The explicit group members with combined intrinsic and instrumental types of motivation outperformed all the other motivation groups on the final gain as it was measured through the delayed vocabulary test. The requirement group, however, lost the most, as 15 points out of the 25.50 retained with the immediate retention faded away between the immediate vocabulary test and the

delayed vocabulary test. A graphic representation of the scores is shown in Figures 12 and 13 below.

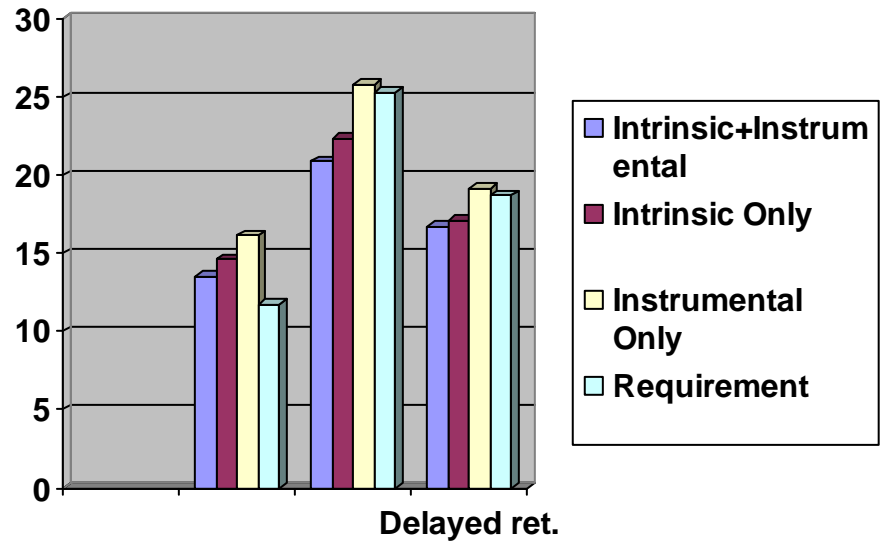


Figure 12: Mean Scores by Motivation Type in the Implicit Group

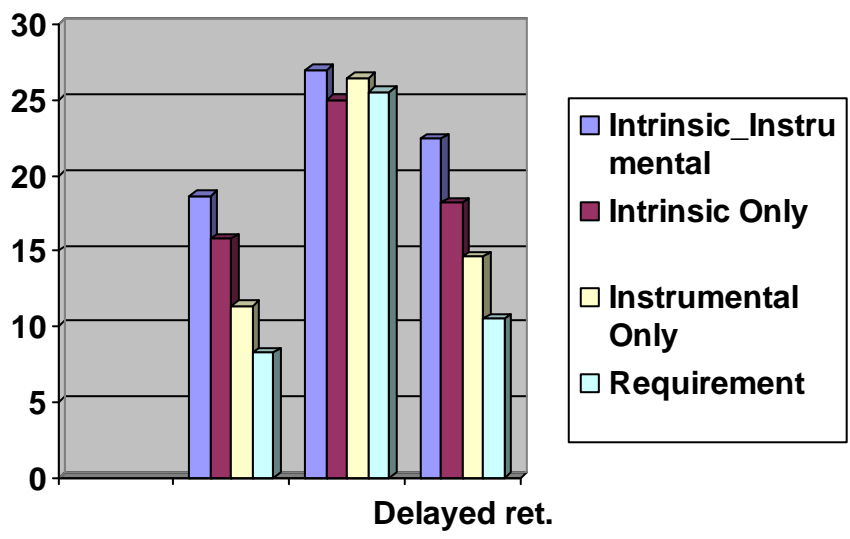


Figure 13: Mean Scores by Motivation Type in the Explicit Group

4.6 Tendencies

A close look at Table 23 replicated from page 205 above and presented below shows two major patterns of change between the two posttests. The standard deviation, standard error of mean, and variance, all followed different patterns: a) In the implicit condition, the standard error of mean, the standard deviation and variance decreased between the two tests of retention; b) In the explicit condition, the standard error of mean, the standard deviation and the variance increased between the two tests of retention. This change is interpreted as a great decline in the performance levels of the explicit group members while the implicit group members preserved more of their gains for at least three and a half weeks when they took the delayed retention posttest. The apparent gain with the delayed posttest might more insightfully be interpreted as a longer retention of the initial gain.

The analysis of the descriptive statistics proves that the subjects in the explicit group gained more vocabulary items than the implicit group subjects on the immediate vocabulary test, but a lot of the gain faded away between the two posttests. The implicit group members on the other hand only moderately gained new vocabulary items, but only a limited amount of their gain faded away over the three and a half week-period observed between the two tests. The implicit group members maintained a higher percentage of the new vocabulary items acquired with the treatment. The explicit group subjects did not maintain their initial gains as much longer as did the implicit group members and ultimately fell behind the implicit group on the delayed vocabulary retention test.

Table 35: Summary of the descriptive statistics of the different test results

	N	Range	Minimum	Maximum	Mean	Std. Error	Std. Deviation	Variance
Comprehension Test Scores	Implicit (39)	24	4	28	13.89	.14	7.16	51.34
	Explicit (39)	23	2	25	14.56	.12	6.26	39.23
Immediate Vocabulary Test Scores	Implicit (39)	19	14	33	22.87	.09	4.60	21.19
	Explicit (39)	24	13	37	25.89	.12	5.98	35.79
Delayed Vocabulary Test Scores	Implicit (39)	15	10	25	17.61	.06	3.33	11.11
	Explicit (39)	27	8	35	17.46	.14	7.01	49.14

$p < .05$

4.7 Additional analysis of variance (ANOVA)

The participant's performance on the comprehension test, the immediate vocabulary test, and the delayed vocabulary test were compared with a Between Groups and Within Groups Analysis of Variance (ANOVA) to examine their effects on the subjects' achievements. The analysis revealed that the main effect is very significant for the immediate vocabulary test scores with $F(1,4912) = 394.633$, with a significance level of .000 at the $p < .01$. This result indicates that the treatment had an important effect on the subjects with regards to the immediate vocabulary test, allowing the comment that the variation observed is not random, but rather a logical effect of the treatment received.

The analyses also revealed a significant main effect on the subjects' performance on the comprehension test with $F(1, 4912) = 12.056$, with a significance level of .001 at the $p < .01$. This result suggests that the treatment had an important positive impact on the subjects and the program determined the subjects' performance at the level they did on the comprehension test. The treatment was helpful and productive for the two measures of immediate retention and narrative comprehension.

As for the results of the analysis of the delayed vocabulary test, the measures indicated that the effect of the treatment was not significant at all. The Between Groups and Within Groups analyses shown in Table 33 below do not reveal any significance at all with $F = .965$ $df(1, 4912)$, $p = .326$. The F value of .965 is situated at less than 1 point, and the coefficient is situated far above the conventionally accepted $p < .05$. The results of the delayed vocabulary test reveal that the level of medium-term vocabulary retention observed is not entirely determined by the treatment but also include additional variables. These could be factors such as other individual difference.

The results of the comparison of the three measures indicate that the immediate vocabulary exercise was the one on which the subjects achieved better with $F = 394.633$ $df(1, 4912)$, with a significance level of .000 at the $p < .01$. The second most important achievement was on the comprehension exercise with $F = 12.056$ $df(1, 4912)$, with a significance level of .001 at the $p < .01$, and finally comes the delayed (or medium-term) retention exercise on which the subjects in both groups did worse than on the others tests with $F = .965$ $df(1, 4912)$, with a significance level of .326 at the $p < .05$ or simply insignificant result as also shown in the ANOVA table below.

Table 36: ANOVA summary table for three experimental variables.

Source		SS	df	MS	F	Sig.
Immediate Vocabulary Test Scores	Between Groups	11246.308	1	11246.308	394.633	.000
	Within Groups	139982.769	4912	28.498		
Delayed Vocabulary Test Scores	Between Groups	29.077	1	29.077	.965	.326
	Within Groups	147982.154	4912	30.127		
Comprehension Test Scores	Between Groups	546.000	1	546.000	12.056	.001
	Within Groups	222464.308	4912	45.290		

The hypothesis formulated stated that there would be no significant difference between the implicit and the explicit groups but in fact, there is one even though it is not significant. This difference is represented by the limited performance difference of 0.15 points between the implicit and explicit groups on the delayed retention scores. In order to provide more explanation, a multiple regression analysis is reported in the next section.

4.7.1 Regression analysis.

In order to explore for additional explanations for the result and check the relationship of predictability between delayed retention the main variable, and the other experimental variables, namely comprehension, immediate vocabulary retention, and total reading time, a multiple regression analysis was run with delayed vocabulary retention as a dependent variable and comprehension, immediate vocabulary retention, and total reading time as the potential predictors. The level of confidence interval was

situated at .05, with both implicit and explicit groups included. The results indicate that the value $r^2 = .177$ when delayed retention is associated with the immediate vocabulary retention. The level of retention on the delayed vocabulary exercise can be predicted at 17% by the level of performance achieved on the immediate vocabulary retention scores. Thus, the level of retention on the immediate vocabulary exercise contributes at 17% into the delayed retention performance. When this prediction is done in relation with a combination of the immediate vocabulary retention and the total reading time, the value becomes $r^2 = .277$, much higher than when it is only related to the immediate vocabulary retention scores. At 27%, the combination of immediate vocabulary score and total reading time are predictors of the level of performance on the delayed retention score. This prediction is a significant .000 coefficient at the $p < .05$ value for the implicit group and also indicates that 27% of the variation in the retention that is dependent on the treatment received by the subjects and contributed by the combined immediate retention and total reading time efforts as presented in Table 36 displayed below.

The multiple regression analyses revealed the Beta weights shown below that explain the level of variability observable in the immediate vocabulary test scores for the implicit and the explicit groups as well as for the total reading time, and their levels of predictability of the subjects' performances on the delayed vocabulary test.

Table 37: The Beta weights observed in the multiple regressions analysis of the experimental variables.

Variable	B	SE	B	t
Immediate Vocabulary Test Scores (Implicit)	.416	.103	.420	4.037
Immediate Vocabulary Test Scores (Explicit)	.388	.098	.392	3.973
Total Reading Time	.008	.003	.318	3.221

The above results in Table 36 show that the Beta weight is powerful in predicting the level of delayed retention from the total reading time but the weights are not powerful enough for the predictability of delayed retention by the variables of immediate retention in the implicit and explicit conditions. These correlations are limited as also shown by the *r*-value discussed earlier in this section.

Ultimately, the results show that immediate vocabulary scores and total reading time are predictors of performance on the delayed vocabulary retention scores, but the level of predictability is not very significant for the immediate vocabulary test scores. The results also indicate that the level of immediate vocabulary retention scores predicts better delayed vocabulary retention scores when it has the contribution of a level of reading time.

4.8 Additional comments

In addition to providing the criteria for classifying the subjects under demographic categories, the responses to the questionnaire given to the students uncovered a number of reactions to the vocabulary teaching program, the software used

in the project as well as the perception of time allocated to the project and the benefits incurred. Some subjects were favorable, and others expressed caution as summarized in the highlights of the subjects' reactions to the different elements of data collection used in the study.

4.8.1 The vocabulary teaching program.

Generally, the majority of students (55%) described the vocabulary program as positive and helpful. Some participants showed enthusiasm about their new vocabulary gains and others questioned themselves whether they would be able to use the new acquisition as should be, justifying their caution by the fact that there were so many new words (65 in total) to learn in a one-hour session on the computer.

4.8.2 The software.

As part of the questionnaire on demographic variables, the subjects were asked to comment on reading from an electronic text and reading from a paper text, as well as to comment on the software, on the time, and potential benefits. As shown here and commented in the following sections, some randomly selected comments reveal that the subjects reacted differently to the tasks. One subject revealed that he "like the interactive program, but staring at a computer screen gets old." Another one expressed satisfaction by saying that the task was "fairly easy" and that it was presented "simply and straightforwardly." The sound was described by a subject as "did not help too much with the vocabulary" while "the straight English translation was the most useful."

There was also a group that was enthusiastic with the electronic text, saying supporting “I prefer the electronic text. The interactivity of the vocabulary words was very easy to get the hang of and very helpful.” “It was easy because some words were highlighted, so it was easier to locate parts of the text when scrolling up and down.” “Yes, having the definitions there makes it more efficient.” “Easy, the definitions were there.” “People who have less experience with computers might have a hard time but, yes, computers are more interactive.” “I like the access to other resources on the computer, dictionary, internet, etc.”

Another group was much more skeptical and revealed that “sometimes it is more difficult to follow long blocks of electronic text, or locate specific passages (without highlighting words).” “Not really. I don't think that it was any easier or harder than reading from a book.” Another subject wrote that “electronic text is much more difficult to understand, you cannot write notes under the text as you read. “ With paper, it's easier to look over a page quickly. I prefer paper source, because I can write notes as I read along.” One subject said: “it was difficult at times. I didn't understand some vocabulary words. It was difficult to look at words not understood. You had to click the word, and then click another section. It is more distracting to focus on a screen.”

4.8.3 Time.

Regarding the time spent in using the vocabulary program, the students described it as useful, beneficial, and helpful. However, one subject stated the following: “I need to rehearse new words in sentences that I invent for the words to remain in my memory as

active use favors retention.” This comment brings in the importance of productive vocabulary and its contribution to retention as opposed to receptive vocabulary. However, this discussion is beyond the scope of the present study.

4.8.4 Benefits.

In relation to what the subjects consider as benefit, they provided the comments below:

“In terms of benefit, I personally don't think that I am able to use all these words. This is because, for me it is necessary to see the English word of the French term more than once. I memorize and learn from repetition, and for me there wasn't enough.”

“Perhaps the story helped me to learn some new vocabulary, but I doubt I will remember it. Retention of vocabulary comes from studying, and it is impossible to study when this program is in a computer lab, and I will be studying at home.”

“It would be difficult to use in speech, but recall for writing would be facilitated easier.”

“Yeah I think I will be able too. There were definitely a few words that I picked up from doing this activity, and I will hopefully be able to retain them.

Part of the content was unfamiliar, mostly the references to specific things.

Some of the vocabulary was new, but not so much that it was incomprehensible.”

4.9 Summary of the results.

The summary of the results reveals that both the implicit and explicit groups did not do very well on the comprehension test as most of the scores obtained by the

members of the two groups on comprehension are situated below 50% of the full score of 50 points. The implicit group members scored fewer points than did the group explicit members as predicted by hypothesis number one. The mean performance of 14.56 points scored by the explicit group members on the comprehension test is not significant but relatively better than the 13.89 points obtained by the implicit group member. This result confirms the hypothesis number one (1) that the implicit group members will not score higher grades than the explicit group members but will retain longer due to the meaning-focused reading and richness of the context (Zahar et al., 2001). According to Chodkiewicz (2001), increasing text comprehensibility promotes a proportional increase in vocabulary acquisition.

On the immediate vocabulary retention test, neither group did well. The explicit group scored a group mean of 25.89 out of 65 points with a significance level of .001 at the $p < .01$, and the implicit group scored 22.87 out of the total of 65 points, with a significance level of .016 at the $p < .05$ level.

Ultimately, the total difference in retention between the two groups at the level of the delayed retention test amounts to only 0.15 points equivalent to .23 % of the total 65 points, with the implicit group ultimately taking the lead. This difference is not significant, but the findings corroborate the notion that implicit vocabulary teaching is beneficial and stimulates mental effort and elaboration as supported by Coady, 1997; Rott, 1999, 2002; Laufer and Hulstijn, 2001; Hulstijn et al., 1996; Yoshii and Flaitz, 2002; DeKeyser, 2003; and Doughty, 2003; Craig and Lockhart, 1972; Craig and Tulving, 1975; Paivio, 1971, 1981; Scott, 1989; and Baddeley, 1991, as the implicit

group ultimately caught up with the explicit group, nullifying the early slight difference between their mean scores. On the other hand, the explicit group members maintained only 67.43 % of their initial vocabulary gain while the implicit group members maintained 77%. They lost a total of 32.57 % of their initial gain as opposed to the implicit group's loss of 23.66 %. A paired sample T-Test comparing the delayed retention scores and the amount of loss experienced by the two groups, the tests shows that the implicit group lost a mean average of 5.282 ($M=5.282$), for a t value of 13.841, df 38 and a significance level of .000 (2-tailed) with the confidence interval of the difference set at 95%.

As for the explicit group, the mean level of the loss is 9.025 ($M=9.025$), for a t value of 4.342, df 38 and a significance level of .000 (2-tailed) with the confidence interval of the difference set at 95% ($p < .05$). Ultimately, both losses are significant but that of the explicit group is very significant.

The results confirm that, in fact, the explicit group that gained more vocabulary items as assessed immediately at the end of the treatment did lose more of its gain than did the implicit group. As for the implicit group, it gained new vocabulary only moderately but also did it only moderately lose from it. This part of the result is in line with Schmitt and Schmitt (1997) who states that newly acquired words and expressions will slip out of memory easier if they are acquired with less effort, as well as with the notion that explicit/intentional procedures are efficient and lead to better comprehension (Hulstijn and DeGraaff, 1994; Ellis, 1994; Schmidt, 1994; Tozcu, 1998), as well as to immediate retention (Pulido, 2003; Sanko, 2006).

In terms of the effect of motivation on comprehension in the implicit condition, both groups scored very poorly. It can be suggested that motivation type does not influence the results that the implicit group members may achieve on a comprehension test.

As for the explicit group, the members with a combined intrinsic and instrumental motivation did slightly better on the comprehension test even though the results were not significant on the immediate retention test; there were no great differences in scores among the motivation groups. All groups did poorly. The requirement condition, however, influenced delayed vocabulary retention the most. As a requirement, the learning condition did not engage the learners actively. Using the scores obtained by the different motivation type subjects in the two conditions, an association can be made between teaching modality, type of motivation and score on the different tests as shown above in the summary of the results by motivation group in Tables 29 and 30.

The intercorrelation analyses between the experimental variables on the comprehension test revealed that comprehension and delayed test scores are strongly and positively correlated. Reading for meaning results in longer retention of vocabulary while direct word learning results in a sizable but not durable immediate retention in the explicit condition.

In both the explicit and implicit conditions, comprehension is achieved respectively poorly and very poorly. On the immediate vocabulary test, the explicit group members retained more vocabulary items than the implicit group members. The analysis shows that delayed retention exceptionally and positively correlates with comprehension,

but negatively does so with motivation groups. On the delayed vocabulary test, the implicit group did better than the explicit group as it lost less than did the explicit group between the two retention tests.

4.10 Conclusion.

This chapter presented the findings of the study and discussed the results by themselves in the first place and compared them to some studies on the notions of implicit and explicit teaching of vocabulary under investigation as well as the intercorrelation between the different variables. The aspects of interest in the findings will be discussed selectively and more in-depth in chapter five, and the implication for teaching, as well as the limitations of the study will be presented.

CHAPTER FIVE: DISCUSSION AND CONCLUSION

5. 1 Introduction

This chapter discusses the results of the different tasks, specifically the effects of implicit and explicit teaching of vocabulary with a hypertext reading task on comprehension, immediate, and delayed or long-term vocabulary retention. It also discusses the interaction between the experimental variables of comprehension, immediate retention, and delayed retention, as well as the effect of type of motivation and reading time on the variables mentioned. Next, it presents the pedagogical implications and discusses the limitations of the study. It finally formulates recommendations for further research.

5. 2 Discussion

In this study, the Computer Assisted Language Learning environment played a very important role in mediating between the learner and the material. This environment was the main portal for the input and the means that helped the learner by delivering the text and allowing navigation between and within the parts of the program. The CALL environment provided additional information that could otherwise not be available to the learner in the modalities used, and allowed the learners to obtain the information that they requested through the hyperlinked glosses. The study supports that CALL facilitates access to the available information in order to help comprehension and retention of the new language (Grace, 1995, 1998; Chapelle, 1998; Rott, 1999; Stepp-Greany's, 2002;

Ariew and Ercetin, 2004; Warschauer and Healey (1998); Groot, 2000; Nokolova 2004; De Ridder, 2002).

The analysis of the results is structured in the order of the research questions. First, I present each research question, again. Next, I take up the question and make comments as to the relevance of the results and the level of significance that they bring into the discussion of the question as is shown below in the present chapter.

5.2.1 Research question 1.

- 1) What is the effect of implicit and explicit teaching of vocabulary on comprehension?
 - a) What is the effect of implicit teaching of vocabulary on text comprehension?
 - b) What is the effect of explicit teaching of vocabulary on text comprehension?

5.2.1.1 Implicit vocabulary teaching and comprehension.

The immediate results obtained by the implicit group members on the comprehension test present a wider level of dispersion in the performance achieved by the individual subjects. The wide range shows a level of difficulty in doing the task as also found in Sanko's (2006) study. In light of the results, and taking into consideration the fact that the implicit group was specifically instructed to read for comprehension, and referring to the disparity observed, it can be inferred that implicit teaching of comprehension presents a low level of initial effectiveness, as supported by Schmitt and Schmitt (1995) and Schmitt (2008). At this initial stage, the implicit group scored very low on the comprehension task, not even reaching fifty per cent of the full score. The

type of instructions provided for reading for comprehension did not have an appreciable effect on the learners' receptivity of the information conveyed by the reading text as the implicit group members scored a statistically insignificant group mean of .271 at the $p < .05$. There was not enough integration of the new information into the learners' knowledge systems.

Both the subjects groups were statistically equal at the onset of the study. The low level of performance experienced by the implicit group may be explained by the type of instruction that they received prior to doing the reading activity. As the general instruction simply asked them to read and understand the text, and the learning of vocabulary was not explicitly stated, the students were attracted by, and focused on words that appeared to them as key to understanding the text. This practice can lead to a misevaluation of the text and text features. As Laufer (1997) states, the students may have had the illusion of knowing some of the words that looked familiar while in fact they did not. They may have concentrated their efforts only on the self-selected words or features.

The level of variation in the results could have also been diversity resulting from individual learning strategies. In the face of difficulty and in order to carry out the activity, each participant might have reverted to his or her own learning strategies due to the absence of an explicit and detailed guidance on the task. This condition implies the idea that clear instructions are necessary in teaching. In order to better comprehend the text, it could have been better to include a feature that increases the perceptual saliency of

the main elements of the text, which could have been more helpful in improving the learner's level of understanding of the narrative.

In the study of incidental acquisition of word meaning in ESL with pre-modified input, Ellis and He's (1999) subjects scored 6.78 points out of 10 or 67.8% on the comprehension test, a very high result in comparison to those of the present study. This difference in the input provided in the two studies is the source of difference in the results. The high level of outcome in Ellis and He (1999) can be linked to the fact that the instructions were more specific, to the pre-modified nature of the input, and to the support of the task with a production activity. This difference in performance can also be linked to the text type and teaching modality. Lee and VanPatten (2003) state that modified input will yield a higher result than raw input. The authentic and unmodified input provided in this study included items that are mainly available in the natural context of language use, including language that proves difficult to non-native speakers. This situation presents a dilemma as modified text may produce higher results while authentic text provides more natural language input. A specification of the key words and key notions comprised in the text would lead to a better level of comprehension.

5.2.1.2 Explicit vocabulary teaching and comprehension.

The overall statistics of the results obtained by the explicit group shown in chapter four above provide more clarity on the distributions of the scores. The results were not different than those obtained by the implicit group members. In spite of the constrain imposed on them by the specific instructions to learn vocabulary, and the

number of glosses that they accessed, be it text only glosses, graphic only glosses or combinations of text and graphic, it cannot be claimed that their results were different as they were almost exactly the same as what was achieved by the implicit group members. The explicit group members' imposed use of the immediate environment in order to be able to understand and retain the target words did not have a notable impact on their level of performance. Even though the explicit group members had to read every single highlighted item in order to be able to proceed to the post reading task and received additional instructions on learning the target items, it only provided a very negligible difference between the results obtained in the two conditions. The subjects in the explicit group comprehended the narrative text in pretty much the same way as those in the implicit as reflected in the negligible difference between the of 13.89 for the implicit group, and 14.54 for the explicit group on the comprehension test, as also represented by the insignificant statistics of respectively .667 for the implicit group and .540 for the explicit group. The two groups performed pretty much badly and equally. The next section discusses the effect of the differential reading time used by the two groups.

5.2.1.3 Reading time and comprehension.

As was noted in chapter four, the design of the implicit and explicit modalities of vocabulary learning, clearly lead to different amounts of time on task. Favored by the design that mandated at least a minimal access of annotations for every single target item, the explicit group read longer with a group means of 599.95 seconds at the $p < .01$, and the implicit group read for 414.36 seconds at the $p < .05$. This difference in reading time

is a reliable explanation for the performance difference on the immediate retention task as the explicit group that read longer, also scored better than the implicit group. The explicit group read for approximately 1/5 of the time longer than the implicit group and the difference in reading time amounts to 92.79 seconds with a significance level of .002 at the $p < .01$. This statistically significant difference between the two groups can be counted as a contributor to the difference in performance between the two groups. Both Roby (1999) and Stalling (1980) support that time on task is beneficial. In the present study, the difference in design also reflected on the results while the difference in time on task appeared to be approximately proportional to the levels of gains achieved by the subjects in the two groups.

As presented below, a comparison of the effect of the two modes of teaching shows that, on average and with regards to the duration, the implicit group members read less than the explicit group members. The implicit group members' individual reading time deviated less from the group mean, giving also a lower level of variance than in the explicit group. This supposes that the implicit modality does not provide diverse reactions while the explicit modality showed a diversity of performance levels from the subjects, giving them the possibility of performing at any rate or level possible. The results suggest that the implicit mode of teaching vocabulary and the explicit mode of teaching vocabulary have differential effects on the subjects' reading time. By requiring the explicit group members to access at least one type of annotation for each target item, the treatment offered to the explicit group also allowed the explicit group members to read longer and perform slightly better on the comprehension test. The treatment offered

to the implicit group did not require the subjects to access annotations for every single target item. The subjects only read what they wanted to read and ignored what they were not interested in reading. The implicit group subjects also read for a shorter period of time, and consequently comprehended less than the explicit group members. Thus, the differences in the treatment also lead to a difference in comprehension. The next section further discusses the performance differences between the two groups.

5.2.1.4 Performance difference between the implicit and explicit groups on the comprehension task.

A comparison of the results obtained by the two groups does not confirm hypothesis number 2 according to which the explicit group members will learn much more immediately when it comes to comprehension. The explicit group members did not score better than the implicit group members on the comprehension test and both groups did very poorly as supported by the group means of 13.89 for a significance level of .353 (2-tailed) for the implicit group, and the mean of 14.56, with a significance level of .271(2-tailed), both at the $p < .05$ level, which means that the difference was not significant. Even though the explicit group members were forced to read every target item and access at least one gloss for each before being able to proceed, the effort did not provide an advantage at the level of the results. As the size of the text and annotations presented to the two groups as treatment was the same in both conditions, the difference in reading time can be considered as spent on additional features, and it is in fact proved by the difference in gloss access between the two groups as the explicit group members

accessed 11.6% more Text Only and 4.4% more Text and Audio glosses than the implicit group, but not in concrete high results on the tests.

The level of performance achieved by the implicit group members shows that the implicit modality of teaching of vocabulary affects the level of comprehension more negatively than does the explicit one as shown through the unequal scores of the two groups, as it lead to a shorter time on task than did the explicit modality. Table 11 in chapter four represents the results on the test comprehension from the two vocabulary teaching modalities as not very different from each other. The next section discusses the central focus of the study, immediate and delayed vocabulary retention in the implicit and explicit conditions.

5.2.2 Research question 2: Retention.

- 2) What is the effect of implicit and explicit teaching on retention?
 - a) What is the effect of implicit teaching on immediate retention?
 - b) What is the effect of explicit teaching on immediate retention?
 - c) What is the effect on implicit teaching on delayed retention?
 - d) What is the effect of explicit teaching on delayed retention?

5.2.2.1 Immediate retention test scores.

The results of the immediate and delayed retention tests shown in chapter four reveal that the implicit and explicit groups performed very differently. The explicit group members retained slightly better on the immediate retention test than did the implicit

group members. The analyses in chapter four reveal that comprehension, immediate retention and delayed retention seem to be interrelated and affect each other at some degree. This finding sheds light on the difference between the two modalities but also presents the strengths and weaknesses of each of them on the teaching of vocabulary with an annotated electronic text. These differences are discussed in the following sections.

5.2.2.2 Implicit vocabulary teaching and immediate retention.

On the immediate retention test, the implicit teaching modalities showed more limitations than the explicit modality, while the explicit group retained more target words than the implicit group members. The implicit group members scored lower than the explicit group members as hypothesized at the onset of the chapter. The present results support hypothesis number one according to which the implicit group members will learn fewer vocabulary words than the explicit group members. These results, while not statistically significant, reflect Hulstijn et al.'s (1996) assertion that incidental vocabulary learning during reading does indeed take place but only incrementally, and in small quantities. Rott's (1999) study concluded that the learners who read more also retained more vocabulary items than those who read less. The results of the present study can also be described as in line with Rott's (2004) assertion that the notions of processing the information of the text and that of storing new words are processes that conflict with each other and that one of them might distract from the other. Apparently, in the implicit condition, the subjects focused on the lexical elements that they considered as important for understanding the text, and comprehended the information as much as they could. But

the quantity of information stored was limited, as only a little from it showed into the results of the immediate retention test of with a mean score of only 17.46 out of 65, thus confirming their choice of focus. By focusing only on words that they believed were problematic and of interest to them, the implicit group members learned the selected items more efficiently than the explicit group members, spending less time on reading. In the end, they retained these items slightly longer than the explicit group members.

As for the explicit group members, they had to access all the annotations, even though they personally found these not very problematic or useful to them. Thus, they read longer and retained more word initially, whatever not significantly different, and forgot more from their gain before the delayed retention task. It can be commented that they did not discern the meanings of the target items carefully enough and thus learned those words somewhat superficially.

Thus, the implicit group members only read the text without extending their action to more glosses as shown in the gloss access patterns of the two groups. They concentrated on the terms that they personally sensed as critical to understanding the narrative. In line with Lomicka's (1998) statement that computerized reading with full glossing may promote a deeper level of text comprehension, it can be added here, based on the present results, that when reading is supplemented with additional activities that are put to use by the learner, it may make a difference. This statement refers to the fact that the explicit group members who consulted more glosses, also scored slightly better than the implicit group subjects who consulted fewer glosses even though the results were not significant.

It can be summarized that implicit teaching of vocabulary does not encourage the learners to extensively look for additional information but rather favors restriction of the activity to the basic effort required by the instructions or to what is perceived as such by the subjects. Leaving the choice of the focus of the learning task entirely to the learner is detrimental to learning a wide range of vocabulary items. Tuning the instruction into more specifications can provide more guidance to learners. In the next section of the study, we discuss the effects of explicit teaching on immediate retention.

5.2.2.3 Explicit vocabulary teaching and immediate retention.

On the immediate vocabulary retention test, the explicit group scored better than did the implicit with a group mean of 25.89 points with a significance level of .001 at the $p < .01$, as opposed to the implicit group's 22.87 points with a significance level of .016 at the $p < .05$ level. In fact, the explicit group members scored better than the implicit group members on the immediate retention test with a significant level of difference of .021(2-tailed) at the $p < .05$ level. These results partially conform with Coady et al.'s (1993) conclusion that explicit learning of vocabulary will be more beneficial than implicit learning as well as Paribakht and Wesche's (1997), conclusion that reading text-based vocabulary exercises leads to superior gains in vocabulary knowledge than reading for comprehension. Hulstijn and Graaff (1994) also found that explicit instruction has greater advantage while Schmit (2008) went further by stating that "the main reason for an explicit focus on vocabulary is that it is effective, although research has demonstrated that valuable learning can accrue from incidental exposure, intentional vocabulary

learning almost always leads to greater and faster gains that can reach productive levels of mastery” (p. 342). According to Hackin and Coady (1999), explicit vocabulary teaching in the context of reading is very beneficial for vocabulary acquisition and exposure to words in context is preferable to exposure to words in isolation while Chodkiewicz (2001) supports that increasing text comprehensibility promotes a proportional increase in vocabulary acquisition. However, this last statement seems less consequent with the implicit modality even though the text for both groups was equally enhanced. Thus, it is appropriate that the explicit group members outperform the implicit group in the immediate acquisition of new vocabulary. The context provided support to the establishment of links between the target items and the learner’s background knowledge, as well as between the target items and their environment of use. Both the highlighting and explicit instructions of vocabulary learning provided in the explicit condition had a positive effect on the subjects’ achievement on the immediate retention test.

The results obtained in this study partially support hypothesis 1b according to which the explicit group members will outperform the implicit group members on the immediate vocabulary retention test as the explicit group members scored better than the implicit group members. The explicit group members retained more vocabulary items immediately. Ultimately the explicit modality of teaching vocabulary can be described as slightly better than the implicit modality as the explicit group members scored better than the implicit group members on the immediate retention task. It can be suggested that focusing the instructions on the target items, providing enough saliency to the target

items as well as pushing the subjects to spend more time on the reading activity can increase the chance of retaining slightly more vocabulary items immediately. These differences in performance support that the explicit modality that is associated with longer time on task is also associated with better immediate vocabulary retention, and thus can be described as slightly better teaching modality when immediate vocabulary retention is the goal. However, a word of caution is needed on this conclusion as the difference in reading time between the two groups and their results on the immediate retention task are not proportionate as the explicit group read for approximately one fifth (1/5) of the time longer than the implicit group but only scored approximately one seventh more than the implicit group. The effect of reading time on immediate retention is discussed next.

5.2.2.4 The effect of reading time in the two conditions.

Table 7 in chapter four replicated below shows the difference in reading time between the subjects in the two groups. The tracking device recorded the mean reading time of 599.95 seconds for the explicit group, and 414.36 seconds for the implicit group. This difference in reading time is due to the fact that the explicit group members had to read every single target word before they could proceed to the next page. Consequently, the explicit group members read longer, but did not score differently. The implicit group members were not constrained to read every target word but advised to read as they pleased and did not read for as long a time as in the explicit modality. They did not score very low in comparison to the explicit group members as there was not a notable

difference between the results obtained on either the comprehension task (13.89 vs. 14.56) or on the delayed retention task on which the implicit group scored a mean of 17.61 and the explicit group and the explicit group scored 17.46. The two groups only differed very slightly on the immediate retention task on which the implicit group scored a mean of 22.87 with a significance level of .016 while the explicit group scored 25.89 with a significance level of .001. On the delayed retention task, however, it rather was the implicit group that had a very slightly better albeit insignificant mean score of 17.61 as opposed to the explicit group's 17.46. This new difference suggests that the implicit modality is associated with slightly longer retention than the explicit modality. The following section discusses the effect of the two modalities on delayed retention.

5.2.2.5 The effect of implicit and explicit teaching of vocabulary on delayed retention.

Delayed or long-term retention is the goal aimed by every learner as they try to acquire language. However, it does not always occur that attempted acquisition is perfectly achieved. It varies according to a number of variables such as the learning contexts as well as the learner's individual difference among other variables. In this section, the relationship between learning and long-term retention is discussed. The implicit group members' delayed retention that remained close to the immediate retention scores indicate that they did not lose more of their initial gains over the period of three and a half weeks. They scored lower on the immediate retention test but secured more of their gains on the delayed retention test than did the members of the explicit group. Due

to the limited reading time presented by the implicit group members on the task (414.36 versus 599.95 seconds) and the limited amount of loss in retention, it can be argued that there was something other than the duration of reading that helped them to retain in slightly firmer way as appears in the results. Thus, the researcher suggests that length of time may not have been a factor in the type of processing of the target lexical units that lead to the noted longer retention. The effect of limited instructions may have provided more focus on the self-selected target items, and triggered deeper processing and the amount of mental effort invested. Especially in the analysis of the images, there must have been greater processing as the consultation of more images was related to longer retention. According to Salomon's (1983) theory of mental effort-dependent success, the degree of retention is related to the degree of mental effort made in the learning process. Hultijn et al. (1996) also insist that deep elaboration on the meaning leads to retention. By striving to understand the meaning of the text and using the learning strategies of their choosing as well as by focusing on other aspects of interest to them, the subjects must have processed the retained items in a more engaged way, by being deeply involved with the items as they tried to make sense of the text. According to Craik and Tulving's (1975) Elaboration Theory, subjects who focus on meaning (even without intention) process stimuli more deeply and retain such stimuli longer than do subjects who pay great deal of attention and who purposely attempt to remember. Thus, the implicit group must have processed the target items more deeply than the subjects in the explicit group. This deep processing of information could have given them the possibility of retaining and remembering what they perceived as key and strived to understand.

This effort also implies the possibility that both the local and global environment could have triggered a higher level of involvement, and that, in turn, the level of involvement could have triggered deep processing, that could have favored longer retention of the learned vocabulary items. Craik (2002), however, argued that deep processing is necessary but not sufficient and that long-term retention involves not only deep processing, but also a process of consolidation that takes into account the complex interaction between top-down and bottom-up processes of learning. The degree of strength of the memory traces may be function of depth of processing, but depth of processing may not be necessarily linked to time on task alone. There may be an incidence of individual difference, or simply that of a strategy use associated with the strong memory traces. Learning strategies may be either rational and describable by the user, or even subconscious as must have happened. Deep processing may be triggered by the degree of difficulty, background knowledge, and familiarity with the subject or the type of action used, and other environmental associations. Other factors such as aptitude and motivation may have contributed to the retention efforts as well. The various theories cited above prove to have affected the results, as the achievements of the implicit group members did not regress more than in the explicit condition.

The results prove that the gains of the implicit group members were solid and most of the items retained were firmly committed to memory in a way that favored longer-term retention. Not only had the intakes of the subjects proceeded from working to short-term memory, but most of it transferred to long-term memory. Long-term is defined here the period of time between the two posttests. This situation reflects similar findings

by Scott (1989) who investigated the implicit teaching of grammar at an intermediate French class and found that the implicit group participants, who focused on the content, clearly understood and remembered numerous details, even long after the research experiment. As the implicit group subjects whose retention lasted relatively longer consulted 26.8% more graphic only glosses than the explicit group, it is safe to say that the consultation of graphic annotations may be associated with longer retention as also supported by Lomicka (1998), and Plass, Chun, Mayer, and Leutner's (2003) finding that the subjects who had visual or verbal only annotations retained better than those who had both verbal and visual annotations. They found that multiple representation of information is not always helpful in learning, as it may hinder low-ability students through the imposed high cognitive load imposed through the requirement of the activity. They suggest that learners should not be forced to select and process both visual and verbal modes. In the present study, the explicit subjects who had to access the annotations to every single target item did not retain longer while those subjects in the implicit group that had the choice retained longer. It is thus suggested here that vocabulary retention tasks with hypertext reading tasks be designed with at least one graphic and one verbal annotation for each target word and that the instructions push the learners to consult the graphic annotations for each item or choose one as desired. This aspect can be used, not only in the implicit condition, but also to reinforce the explicit condition and provide it with a feature tuned toward longer retention as discussed above.

Depth of processing, however, may not be necessarily and solely related to time, as a learner can be deeply involved in an activity within a short period of time as it is also possible to be engaged in an activity for a longer period of time without being deeply involved. Each of the situations will have an effect that corroborates with its structure and processing mode. As the better retention recorded at the immediate test dropped dramatically with the delayed retention test than it did in the implicit condition, the explicit group members lost more of their gains over the three and a half weeks than did the implicit group members. This loss supports hypothesis 1b according to which the explicit group members will gain more vocabulary immediately, but an important part of this gain will fade away sooner than it will from the implicit group members. The result supports Paribakht and Wesche's (1997) and Zimmerman's (1997) assertion that the explicit group members will gain more vocabulary immediately but will retain only moderately over time. It appears that, in the explicit condition, the subjects who spent more time to read and had to look up all the items had their attention on too many items and did not think much about which ones were important or not. They did not have to closely sort out the information and ended with allocating fewer efforts to the individual items and not concentrating on specifically chosen items. This dispersion of attention must have been the main reason for early forgetting. This apparently superficial involvement must have required fewer efforts and limited depth of processing in the initial retention effort than in the implicit condition. Herman (2003) reported that the simple memorization of paired associates entailed a decline in mean performance between posttests. In this study, the limited effort associated with the initial retention

activity in the explicit condition can be blamed for the reduction in retention over the three and a half weeks. By focusing on accessing the annotations attached to each target item, the explicit group subjects read widely more but did not sort out the information enough to get into the deep meaning of the items as much as could be necessary to help them retain longer the meaning that was retrieved. This limited the effort applied to learning the meaning rather provided a shallow interaction with the items, and lead to not long enough retention time for many more items to stay in mind until the delayed retention task as was the case for the implicit group subjects. As a consequence, it can be suggested that vocabulary-learning tasks that require more efforts, provide longer retention than the ones that do not require the same level of effort.

The inequality between the levels of retention of the two groups reflects that the implicit modality of teaching vocabulary leads to longer retention even though the difference is not statistically significant. The subjects in the explicit group primarily retained more new vocabulary items than the implicit group subjects, but many of the retained items were forgotten earlier than those of the implicit group subjects, due to the reduced level of processing and the ease of retention. This finding also supports hypothesis number one according to which the implicit group members will gain new vocabulary only moderately but will retain them longer than the explicit group members. It also corroborate with the notion that implicit vocabulary teaching is beneficial and stimulates mental effort and elaboration as supported by Coady, 1997; Rott, 1999, 2002; Laufer and Hulstijn, 2001; Hulstijn et al., 1996; Yoshii and Flaitz, 2002; DeKeyser, 2003; and Doughty, 2003. Craig and Lockhart, 1972; Craig and Tulving, 1975; Paivio, 1971,

1981; Scott, 1989; and Baddeley, 1991. The implicit modality is thus associated with longer retention while the explicit modality is associated with slightly larger immediate retention but falls short on more delayed retention as reflected in the comparative Figures 14a and 14b shown below.

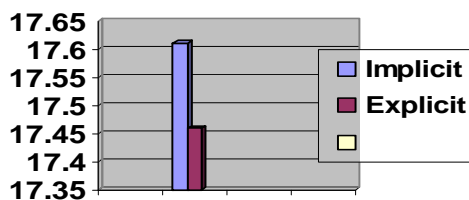
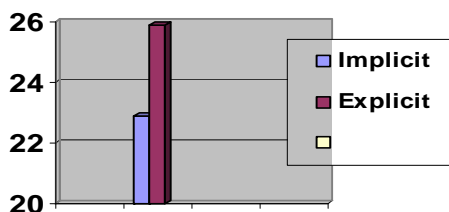


Figure 14a: *Immediate Retention Scores by the Implicit and Explicit Groups*

Figure 14b: *Delayed Retention Scores of the Implicit and Explicit Groups*

Figure 14: *Immediate and Delayed Retention Scores in the Implicit and Explicit Conditions.*

The differences shown above reveal that the explicit group members had higher scores than the implicit group members on the immediate test while the condition reversed with the delayed vocabulary retention task. The groups mean score achieved by the implicit group members was low on the immediate retention test, but that of the explicit group became even lower on the delayed retention test even though not significantly. The implicit group ultimately had more gain, surpassing the explicit group

by a difference in score of 0.15 points. Nevertheless, the final 0.15 points difference between the two groups on the delayed retention scores is small and statistically insignificant with a level of .905 at the $p < .05$ level. This difference is not significant and does not provide opportunities for describing the two modalities as very different on long-term retention. They only have a limited difference.

5. 2. 2.6 Summary of the different test results.

The implicit group gained new vocabulary only moderately but also did it only moderately loose from it, while the explicit group gained more vocabulary words immediately but also forgot more of them by the time of the delayed retention task. This part of the result is in line with Schmitt and Schmitt (1997) who states that newly acquired words and expressions will slip out of memory easier if they are acquired with less effort. Hunt and Beglar (2005) provide a framework, Scott (1989), Paribakht and Wesche (1997), Zimmerman (1997), Nation and Waring (1997), and Watanabe (1997) suggest the combination of both modalities for a better learning and longer term retention of new vocabulary items. Studies of vocabulary acquisition in CALL such as Groot (2000), Yoshii and Flaitz (2002), Yeh and Wang (2003), Jordan and Sanchez (1994), Chun and Plass (1996), Jones (2003) Al-Seghayer (2001), and Plass and Jones (2005) on their side credit depth of processing, multi-modality, and Multiplicity of exposures beyond the modalities.

Just as argued by Schmidt (1995b), attention, consciousness, and awareness are necessary for learning. In relation to the level of efforts associated with the challenge and

the strive to understand as well as that of doing the task at hand, it can be commented that longer retention is not necessarily a function of time on task, but rather depends on deeper involvement, more focused attention, and depth of processing of the information under study. Saliency helps in learning by focusing attention on target features. The subjects in the implicit group had more limited reading time and yet retained longer than the explicit group members. This result provides reasons to consider that while striving to understand the meaning of the target words, the subjects in the implicit group applied a deeper level of involvement and processing in learning the chosen words. These levels of involvement and processing must have created stronger memory traces in the subject's minds; some kind of memory traces not easy to fade away. This kind of access to the target information can be considered as a justification for the slightly longer retention of most of what the implicit group members retained with the comprehension exercise. The next section discusses the results of the correlation between motivation and achievement.

5.2.3 Research question 3.

3) What is the effect of learner motivation on text comprehension and vocabulary retention in implicit and explicit teaching of vocabulary?

5.2.3.1 Motivation and performance.

This section discusses the relationship between motivation and the outcome of the different tests in the two conditions. Motivation, a driving force behind every activity, mostly affects both the steps taken by a learner and shows in the final outcome of an

activity. Motivation may not be taken for granted, as it may not be enough for a learner to report his or her level of motivation. The degree of achievement in an activity can either be boosted or hindered by the level of motivation applied to the learning situation. Motivation needs to be translated into action by the learner in order to add an effect on a learning activity. Whenever a concrete action is not taken, motivation may remain latent and not produce any measurable change of behavior, as well as affect the potential results as can be expected. Reported motivation does not necessarily match its effect on an activity. Amabile (1985) states that “the act of reading, concentrating on, and applying to oneself the extrinsic or intrinsic reasons for task activity can make that particular motivational orientation salient or temporarily induce that orientation” (p. 395), supposing that putting motivation into practice will produce the real benefit that it provides.

5.2.3.1.1 Motivation and performance in the implicit condition.

When taken globally, the result of the different tests show negative relationships between motivation and the experimental variables. However, a detailed look at the results obtained by the individual motivation group shows variation in the performance levels. In the implicit condition, the achieved significance level of .040 on the immediate retention task at the $p < .05$ level supposes that the level of motivation presented by the subjects positively influenced the level of immediate retention of vocabulary in the implicit condition at the probability level of 95% of the achievement. All the other variables including comprehension, delayed retention, and reading time were not

significantly and positively linked to motivation. Motivation does not have a positive and significant relationship with the levels of comprehension, delayed retention, or reading time as the respective levels of significance were .715, .345, and .146 at the $p < .05$ level. However, on the immediate retention task, the instrumental only group scored the mean of 25.85, with a significance level of .040, at the $p < .05$ level while the requirement group also scored a near significant score of 25.28. This result supposes that in both conditions, when the type of motivation is only a requirement or solely instrumental, it does not make any great difference to use either of the modalities. The subjects in both conditions perform almost similarly as is shown in Table 37 below. In the explicit condition, however, motivation may be a factor in short-term retention for the *Intrinsic Only* or a combination of *intrinsic and instrumental* motivation as these motivation groups scored respectively 25, and 27 points as opposed to the implicit group subjects' lower scores of respectively 22.37, and 20.88 points. These differences of outcome between the two groups suggest that intrinsic motivation and a combination of intrinsic and instrumental motivation may be predictors of fairly good performance in immediate retention in the explicit condition. The scores in the two groups, as summarized in Table 37 below are different, with a significance level of .021(2-tailed) at the $p < .05$.

Table 37: *Results by Motivation Group on all the three Tests in the Implicit and Explicit Conditions*

Implicit	N (39)		CompTestScores		ImmTestScores		DelTestScores		Loss	
	Impl.	Expl.	Impl.	Expl.	Impl.	Expl.	Impl.	Expl.	Impl.	Expl.
Intrinsic & instrumental	17	9	13.52	18.66	20.88	27.00	16.76	22.44	4.12	4.56
Intrinsic only	8	16	14.62	15.81	22.37	25.00	17.12	18.18	5.25	6.82
Instrumental only	7	10	16.14	11.40	25.85	26.50	19.14	14.60	6.71	11.9
Requirement	7	4	11.71	8.25	25.28	25.50	18.71	10.50	6.57	15

$p < .05$

As the implicit modality of teaching vocabulary with a hypertext reading task favors less loss on the delayed retention task, it can be suggested that an implicit feature be associated with the explicit modality so that the better level of immediate retention of the explicit modality also receives a characteristic that will allow the subjects to lose less from their immediate retention scores and thus, consolidate more of their vocabulary gains. The next section discusses the relationship between motivation and performance in the explicit condition.

5.2.3.1.2 *Motivation and performance in the explicit condition.*

When classified by motivation group, the results of the different tests taken by the subjects in the explicit condition show a different pattern of relationship with the different motivation types in the implicit condition. Immediate retention, delayed

retention, comprehension, and reading time are significantly associated with motivation, with the respective significance levels of .002 and .012 at the $p < .05$ level, .008, and .001 at the $p < .01$ level. All the motivation groups in the explicit condition scored significant group means, respectively 27.00 for the intrinsic and instrumental group; 25.00 for the intrinsic only group; 26.50 for the instrumental only group; and 25.50 for the requirement group. The overall average for the explicit group is 25.89, significant at the $p < .05$ level.

This supposes that motivation is a factor that influences the levels of immediate and long-term retention, text comprehension, and interacts with reading time in ways that are helpful to the performance levels of the learners when vocabulary is taught explicitly through a hypertext reading task. As the levels of motivation are positively and significantly associated with better performance in the explicit condition, it can be suggested that ways and techniques of improving the level of motivation in learners need to be provided when planning to teach vocabulary explicitly with CALL, using an electronic text, providing enhancements.

A comparison between the results achieved by the two groups to reveal the significance levels in the differences showed that some results are not significantly different between the two groups while others are. The comprehension and delayed scores in both groups are insignificant with the respective levels of .687 (2-tailed) and .905 (2-tailed). On the contrary, the scores of the immediate retention and reading time compared across groups present significant differences with the respective significance levels of .021 (2-tailed), and .000 (2-tailed). This means that, on the immediate retention

test, the two groups scored very differently, and that, according to the results, one modality leads to better results than the other. Where the difference is not significant, it is assumed that the two modalities do not produce very different effects. Where the difference is significant, it shows that one modality leads to a better result than the other, whatever significant or not it is, and the implicit group is the one that ultimately has the better result on the delayed retention task.

5.2.3.2 Summary.

In this study, instrumental motivation appears to be associated with better performance in vocabulary acquisition as the instrumental group achieved better results than the others. As for requirement, it is associated with good performance on the immediate retention context as the mean score of the group is fairly good. This supposes that learners who took French as a foreign language as a requirement made more efforts on the immediate reading task. This can also suggest that they felt the constraint of doing the activity well immediately to avoid failure. Intrinsic motivation and its combination with instrumental motivation are associated with low achievement in vocabulary learning. As for the effect of motivation on comprehension in the implicit condition, the instrumental only type of motivation may be a primary predictor of better achievement in comprehension, as well as in immediate and delayed retention. In the explicit group, the subjects with a combined intrinsic and instrumental motivation achieved the best on the comprehension test while on the immediate retention test; all the motivation groups did somewhat similarly. This supposes also that motivation may not be an important factor in

immediate retention in the explicit condition. The requirement condition however affected delayed vocabulary retention the most, supposing that the students who took French as a requirement retained longer than the other motivation groups. It can be suggested that some level of pressure in a learning activity may be beneficial in focusing attention in some positive way.

Also as shown in the correlation tables of the experimental variables, it can be stated that in the explicit condition, comprehension positively correlates with long-term retention, but does so negatively with immediate retention. The level of achievement in short-term or long-term vocabulary retention as well as in narrative comprehension retention depends on the types of motivation and how operationalized that level of motivation may be.

5.2.3.3 Retention.

Retention may be function of the degree of difficulty, background knowledge, familiarity with the type of action needed, environmental association, and individual differences. The explicit condition forced the subjects to read longer but failed to help them retain longer. They seem to have used multiple strategies but their results remained insignificant. The illusion –if I can call it this way- that they presented in scoring significantly higher than the implicit group on the immediate retention test showed the explicit group members as performing slightly better but this edge dramatically disappeared before the delayed retention task. The implicit group members read for a shorter period of time and achieved less in terms of comprehension as well as in

immediate retention but kept their level of retention far later in time than the explicit group members. Because of the lack of saliency on the target words and that of requirement to access at least one enhancement for every target item, the subjects in the implicit group focused on self-select words and phrases that they believed, must be key to understanding the narrative. They focused more attention, certainly processed the items deeply, and retained over a longer period of time. It can also be commented here that the freedom to read as much as one feels necessary and the freedom to select vocabulary items to understand is a positive situation that favors longer retention of what is learned. As for long-term retention, the implicit modality appears conducive to a lesser loss over time and thus a longer-term retention, a condition that can be important for its pedagogical implications.

5.3 Pedagogical Implications

5.3.1 The role of instruction.

Instruction is paramount. It maximizes the pedagogical intervention, improves learning, and needs to be structured in accordance with the expected outcome of the teaching and learning activity, and learner characteristics.

In addition to the question of instruction, the results of the present study raise that of choice and adaptation of materials, definition of affective conditions in language teaching and learning, as well as the teaching and learning environment, all around the learner.

In order to improve comprehension, it is not sufficient to instruct learners only to read a text; more is needed. CALL reading, more than any other kind of reading, needs

preliminary and clear statement of the goal of the task to the student, and the specification the structure of the potential steps underlying the instructions included in the task in order to provide the learners with more independence in learning. These structures must be tuned to capture the attention of the student and link the steps to the elements of interest to the learner. The layers in the process of achieving the task must be specified and made easily perceptible to the learner. They must be perceptually salient.

It is more productive to focus instruction on attention-promoting tips and task organization structures and devices that promote deep processing and higher level of task involvement. This attention-getting device will improve the level of motivation of the subject and lead to the activation of his or her potentials for integrating pieces of information into his or her knowledge structure. Even implicit teaching and learning has to be structured, have both overt and covert objectives. The former objective will be clearly specified to the learner, and the latter needs to be made to underlie the actual task. The covert objective needs to be perceived as a necessary springboard to the overt objective.

5.3.2 Implicit teaching and vocabulary learning.

Based on the results of the present study, it is suggested that any task that aims to provide learners with opportunities to learn subconsciously needs to be structured in a way that attracts or even pushes the subject toward noticing the individual key features that will serve as springboard to understanding the information under study in order to

reach the covert objective while completing the overt task and aiming at the goal of this overt task through perceptual saliency and increased involvement.

This configuration will focus the learner's attention into noticing the secondary information that is, in fact, the actual objective of the overall task, and the actual objective will be achieved as a by-product of the task.

The instructions need to aim at defined aspects, steps, and stages in the process of doing the task such as targeting the duration and the stimulation of attention, focusing on key features, specifying steps in the practices that will trigger deep processing, conscious collection of information in order to achieve the goal in hand, and make use of a conscious organization of the target information for later use. This will be practically applied as suggested below and more, depending on the task type and the underlying objectives.

1. Providing a detailed specification of the goals and objectives of the overall task;
2. Specifying the steps in the process that may trigger the apperception of the specific target features or units;
3. Use of "pseudo free-reading" or processing activity that highlights the actual and covert objective and presents it as the only way toward the achievement of the overt objective;
4. Clearly determining the task type or language type(s) aimed by the so-called "pseudo-free" activity;
5. Rationally planning the articulation of the pseudo-free task toward gearing its outcome to the specific and structured field of knowledge under study;

6. Creating a practical situation that will push the learner toward the perception of the actual goal that is presented as a secondary one, and incorporating it as a by-product that serves as a springboard to the achievement of the overt goal.
7. Providing features that amplify the perceptual saliency of the target items and features and may contribute to improving comprehension through a hypertext reading task, and teaching comprehension as a by-product that may entail slightly better retention of vocabulary than focusing on comprehension as such.

5.3.3 Explicit teaching and vocabulary learning.

The results of the present study show that explicit teaching is not better than implicit teaching because it seems to be associated with more premature slippage in memory. As the final difference between the results obtained by the two groups is not statistically significant, they might be attributable to chance as well. In the end, the two modalities prove not to be notably different. In an attempt to support individual difference, the combination of the two can provide the subjects with additional learning strategies, opportunities to deeply process the information by creating in them the need to ponder over specific elements of interest such as key features, keywords, key notions, and especially key processes that will push the learners into intensive cognitive activities.

This combination is in line with Beglar and Hunt's (2005) suggestion for combining implicit and explicit teaching practices. By going through these covert steps, the cognitive mechanism will make use of more and deeper mental processes, not in relation with the time invested but rather the mental processes that allow more

consistency and depth of implantation of the resulting memory traces. Obviously, when people learn, they do not intend to master the object temporarily but rather indefinitely. Learning is about storing knowledge indefinitely, and this is a defining reason for striving to find out a pedagogical procedure that may favor longer-term retention rather than gaining knowledge to only lose it not so long afterward.

5.3.4 Dual modality use in vocabulary teaching and learning.

Both implicit and explicit modalities need to be balanced in teaching in general and in teaching vocabulary in particular. Data in this study shows that, over time, the implicit group members lost slightly less from their immediate gain in vocabulary than did the explicit group members, despite the fact that the results were not statistically significant. It would be a more profitable option to combine both modalities to facilitate learning of new items, and for longer retention.

The researcher argues that, in teaching vocabulary, implicit teaching helps to maintain the target items over a longer period of time while the explicit teaching modality appears to negligibly favor immediate vocabulary retention without the advantage of maintaining the retained items longer over time. Next, we discuss the relationship between reported motivation and actual performance in language production.

5.3.5 Putting motivation to work.

The level of motivation described by the subjects does not always and necessarily match that of the resulting performance. Some subjects who report high levels of

motivation come to produce proportionally high enough with the levels of motivation that they declared at the moment of filling out the questionnaire. Others do not. This can be either a misrepresentation of their levels of motivation or simply the consequence of a variation in their levels of motivation as motivation can fluctuate with the circumstances of any given moment in the lives of the subjects.

Learners need to translate their levels of motivation into active use in order to obtain a proportionally high level of achievement. This can happen if the degree of motivation is concretely operationalized throughout the execution of the activity. Otherwise, the level of motivation will be a latent and passive affective condition without concrete display and incidence over the subject's level of performance. In order to verify the actual operationalization of his or her level of motivation, a learner can match each level of his or her degree of motivation with its translation into specific stages of the task at hand. This way the level of reported motivation may actually match its practical repercussion into a given activity performed by the subject.

5.3.6 Use of software for vocabulary learning.

Software seems to be more appropriate when the target of the learning is a specific repertoire for example basic core knowledge in a given field.

The results of this study suggest that enhancement is provided for vocabulary learning through, at least, combined textual and graphic representations of the target items in the design. The instructions provided to the students should focus on pushing them into consulting both textual and graphic annotations. They should be combined in such a way

that when a user clicks on one type, he or she will necessarily also have access to the other. This will constrain the learner to consult both the textual and graphic annotations together. Immediate retention will be favored and there will be less loss or longer retention over time.

5.4 Limitations of the Study

The study could have provided more precise analysis if it had concentrated on only one of the three experimental variables. Its one shot aspect and the limited number of cases do not lend to generalization of the observed phenomena while a longitudinal study would provide more information than what is reported throughout the study. Additionally, the great number of target items did not facilitate the focus on specific aspects such as multiword units. Dividing the lexical items into categories would have provided more specifically targeted information. A selection of specific phrases could have provided a uniform type of finding, and allow for more selective analyses, but that would have affected the authenticity of the text.

Carrying out the study on a single campus does not provide a variety of perspectives. A multi-campus study over a number of semesters would provide a variety of environment and outcomes that would allow a diversity of results. A pre-test-posttest design reinforced with a delayed test on all the variables, or a pre-test administered to both groups and a delayed test of comprehension added to the current structure could provide more valuable information that will help determine the gains on comprehension more completely.

An investigation of the learning strategies used in the present study by the learners in both conditions could have provided more important information about depth of processing and its relationship with longer-term retention.

5.5 Recommendations for Future Research

In the process of choosing target words, it may be better to select a limited but focused and structurally targeted type of lexical items. A replication of this study with not use only the definitions used as textual enhancement, but also corpora samples with for example five entries for each of the words can provide information on the effect of formal and informal use of vocabulary items on comprehension and retention. This additional format will provide information on the interaction between culture and vocabulary acquisition.

Additional investigation is needed to further examine the relationship between the implicit and explicit modalities over a longer period of time with fewer target items and a greater number of participants from a variety of backgrounds. Adding a production task to the recognition exercise will allow the assessment of the actual use of the target items. It would also be interesting to administer a third test to investigate the effects of the treatment beyond the two tests. A test over a three or six-month period will exhibit either a more positive or negative result in terms of retention as the subjects will have more time for either a positive or negative “digestion” of the new acquisitions. Adding a third modality or condition in which the learners are given the same treatment-base but without

any instructions at all, or that combines the implicit and explicit modalities can be more informative than the recorded results.

5.6 Conclusion

This study has shown that teaching vocabulary implicitly through reading, without detailed instructions and teaching vocabulary explicitly by giving detailed and precise instructions on the objective(s) of the activity produce different outcomes. In the first modality, the learners strive to do the activity and gain moderately but sustain their gains substantially even three and a half weeks later. The second modality makes it easier for the learners to focus on the overt objective and acquire substantially more gain immediately. However, when tested again three and a half weeks later, the learners in the explicit condition presented a bigger loss from their immediate gains. The erosion of a great portion of the immediate acquisition is explained by the fact that the modality they used provided them with most of the information needed and thus they made less mental efforts in the memorization of the target words. The limited processing associated with the acquisition of the new items did not favor stronger memory traces. This is one explanation on their loss over the three and a half week period. The implicit group gained a small amount of vocabulary but mostly secured more items than the explicit group members who initially gained more new vocabulary but did not maintain most of it over the same time period. The study suggests that both the implicit and the explicit modalities have advantages in teaching vocabulary in Computer-Assisted Language Learning when additional help is hypertext to potential problem sources but more importantly, the

implicit group appears to be the one that helps to retain more items from the task and consequently, is the best. The researcher argues that combining the implicit and explicit modalities would be more beneficial for the learners than using only one modality, as the use of a dual modality would favor and address dual learning strategies that otherwise would offer to be available at the same time. The study also reports that motivation is a good source of momentum in learning under the condition that the feeling it generates is transformed into action or generates a strategy that is effectively used. Otherwise, motivation would be a latent potential with little or no positive effects on learning. Among others, Computer-Assisted vocabulary learning and teaching programs provide learners with the advantage of keeping up with the available instructions for their tasks. CALL provides learners with more freedom and choice that can be translated into a perception of freedom and a better level of involvement into the learning process, and consequently obtain better results.

APPENDIXES

APPENDIX A : THE READING TEXT

Les Petits Enfants du Siècle

Je récupérai ma cuisine et ouvris mon cahier. Un instant j'entendis la mère se plaindre à côté : Oh ! là ! là ! ce que je suis fatiguée oh ! là ! là ! ce que je peux être fatiguée ils me feront mourir : ils me feront mourir ces gosses, je suis rendue oh ! là ! là ! mon dieu que je peux être fatiguée c'est rien de le dire oh ! là ! là ! mon dieu que je suis fatiguée.

Le ronflement du père s'élevait déjà dans la nuit profonde. Le sommier grinça, elle rentra au lit. Soupir. Silence. Soulagement. Paix. « Le mouchoir que tu m'as donné quand j'ai eu la croix est blanc. Le mouchoir que tu m'as donné quand j'ai eu la croix est blanc.

« Le mouchoir est blanc », proposition principale;

« Le », article défini;

« Mouchoir », nom commun masculin singulier, sujet de « est »;

« Est », verbe être. 3e personne du singulier, présent de l'indicatif;

«(Blanc », adjectif masculin singulier; attribut de « mouchoir »;

« Que tu m'as donné », proposition subordonnée, complément de « mouchoir »; « Que ».

Conjonction de subordination;

« Tu », pronom personnel. 2^o personne du singulier, sujet de « as donné »; « m' », pronom personnel, 1^{re} personne du singulier, complément indirect de « as donné ».

Plus un devoir était long, plus j'étais contente. La plume grattait, dans le silence. J'aimais ça. J'aimais la plume, le papier, et même les cinq petites lignes dans lesquelles il fallait mettre les lettres, et les devoirs les plus embêtants, les grandes divisions, les règles de trois, et j'aimais par-dessus tout l'analyse grammaticale. Ce truc-là m'emballait. Les autres filles disaient que ça ne servait à rien. Moi ça ne me gênait pas. Même je crois que plus ça ne servait à rien plus ça me plaisait.

J'aurais bien passé ma vie à faire rien que des choses qui ne servaient à rien.

« As », verbe être, 2eme personne du singulier, auxiliaire de « donné »;

« Donné », verbe donner, participe passé. La maîtresse disait : « Ce n'est pas la peine d'en mettre tant Josyane; essaie plutôt de ne pas laisser d'étourderies ça vaudra mieux. » Car des fautes ça j'en faisais, et finalement j'étais plutôt dans les moyennes; de toute façon, je n'essayais pas de me battre pour être première. Ça ne m'intéressait pas. Pourquoi être première ? Ce que les gens pensaient de moi m'était dans l'ensemble bien égal.

La maîtresse avait écrit dans le livret : « Indifférente aux compliments comme aux reproches », mais comme personne ne l'avait jamais regardé ce livret elle aurait aussi bien pu marquer c'est le printemps, ou Toto aime Zizi ou cette fille est une nouille, ça n'aurait pas fait de différence. Une fois dans la classe d'avant j'avais été troisième, on ne sait pas pourquoi, un coup de veine, toutes les autres devaient être malades; j'avais mis le livret sous le nez de papa ce coup-là, il l'avait regardé et me l'avait rendu en disant « Ah ! Bon. » Au cas où la colonne lui aurait échappé je dis : « Je suis troisième. » Ça donna : « Ah ! bon. » Point c'est tout. Du reste, je m'en foutais de ce qu'il pouvait dire.

(Les Petits Enfants du Siècle, Christiane Rochefort, In Ariew and Nerenz, (1993). Par Ici. Heath

APPENDIX B : BACKGROUND QUESTIONNAIRE

Participant code: _____

I. Personal information

Nationality: _____

Age: _____

Gender: _____

II. Language background

1). First language: _____

2). Other languages: _____

	Names of languages by order of fluency	Length of study
a)		
b)		
c)		
d)		
e)		

3). Purpose for learning French: _____

4) How did you have access to this class of ?
_____5). How would you describe your level of French?

_____6). If you are planning to study French beyond this course, will it be your major or minor?
_____7). How often do you communicate in French?
_____8). How often do you read books related to French culture?

_____9). How many hours per week do you use the World Wide Web on average to learn or practice your French?
_____10). How many hours do you watch francophone TV per week?

11). How many hours do you listen to French language radio programs?

III. Learning foreign languages

Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.

Underline the appropriate number in each line.

- | | |
|---|---------|
| a). Learning foreign languages is fun | 1 2 3 4 |
| b). Knowing a foreign language guarantees a better future | 1 2 3 4 |
| c). I enjoy reading foreign language texts | 1 2 3 4 |
| d). I like to acquire foreign cultural knowledge | 1 2 3 4 |
| e). Learning foreign culture is an advantage | 1 2 3 4 |
| f). Learning French culture is fun | 1 2 3 4 |

IV. Learning foreign language vocabulary

Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.

Underline the appropriate number in each line.

- | | |
|--|---------|
| a) It is fun to learn foreign language vocabulary | 1 2 3 4 |
| b) It is necessary to learn foreign language vocabulary | 1 2 3 4 |
| c) Foreign language vocabulary is as important as foreign language grammar | 1 2 3 4 |
| d) Foreign language vocabulary is more important than grammar | 1 2 3 4 |
| e) Foreign language grammar is more important than vocabulary | 1 2 3 4 |

Ce nouveau médicament contre le cancer semble être efficace. Il offre _____
 a) une guérison complète b) un repos total c) un soulagement immédiat d) une santé parfaite

16. La paix

Depuis 1945 les pays de l'Europe de l'Ouest connaissent une _____ durable. Il n'y a aucun conflit majeur à signaler.
 a) progression b) paix c) régression d) agitation

17. un mouchoir

Cette femme est très élégante. Avec ses belles robes parfois elle porte _____ autour de son cou.
 a) un mouchoir b) une chemisette c) une cravate d) un nœud papillon

19. une proposition

Pour analyser une phrase, on la divise d'abord en _____.
 a) groupes de mots b) mots individuels c) expressions d) propositions

20. un attribut

Un adjectif employé avec un verbe d'état est _____ du sujet.
 a) complément b) attribut c) épithète d) apposition

23. un devoir

Les _____ à faire à la maison n'offrent pas aux étudiants la possibilité de poser des questions de clarification des qu'un problème se pose.
 a) pratiques b) devoirs c) leçons d) compositions

25. la plume

Les plumes avec lesquelles on écrivait autrefois ont disparu pour laisser la place aux crayons à billes
 Les anciens écritoirs qu'on trempait dans de l'encre portaient _____
 a) le nom de leur inventeur b) le nom d'une partie d'un animal c) le nom d'une partie d'un oiseau d) le nom du pays où ils ont été utilisés pour la première fois.

26. gratter

La bille du bic glisse bien sur le papier alors que le bout de la plume _____ le papier.
 a) gratte b) glisse c) remplit d) déplace

28. falloir

Pour obtenir de bons résultats au travail il va _____ faire des efforts constants
 a) savoir b) connaître c) penser à d) falloir

29. embêtant

C'est vraiment très _____ de ne pas obtenir tout ce qu'on veut.

- a) effrayant b) embêtant c) reposant d) intéressant

34. un truc

Lorsque le nom d'une chose vous échappe, c'est commun d'employer le mot « machin » ou « ____ » à sa place. a) truc b) chose c) objet d) mot

36. gêner

Les personnes timides sont toujours _____ par la présence de celles qu'elles ne connaissent pas.

- a) encouragées b) intéressées c) favorisées d) gênées

37. une maîtresse

Lorsque j'étais à l'école maternelle, notre _____ s'appelait Mme Tournier. Chaque jour elle nous apprenait à lire, à écrire et à compter.

- a) professeur b) enseignant c) maitresse d) bonne

39. tant

Souvent, les enfants mangent beaucoup plus de chocolat que les adultes. Ils l'aiment ____ .

- a) quelque peu b) tant c) peu d) assez bien

40. essayer

Dans le cas où vous devez acheter un habit qui ne porte pas de numéro, il serait préférable de _____ avant de prendre la décision finale.

- a) bien l'observer b) le mesurer c) l'essayer d) l'adapter à votre taille

41. une étourderie

Il ne fait jamais de/d'_____. A chaque fois qu'il a un problème, il réfléchit sérieusement avant de décider.

- a) erreurs b) étourderies c) fautes d) problèmes

45. penser

Réfléchir au sujet de quelque chose, c'est _____

- a) y croire b) y penser c) l'examiner d) la connaître

47. un livret

A la fin de chaque semestre ou trimestre, les écoliers reçoivent chacun son _____ scolaire, qui contient la synthèse de son travail scolaire.

- a) Cahier b) livre c) livret d) cartable

48. une nouille

D'une manière informelle on emploie le mot ____ pour désigner quelqu'un qui est stupide.

- a) clochard b) nouille c) fou d) cinglé

54. une colonne

Sur une page de journal, les textes sont organisés en _____. Ceci facilite la lecture des articles.

- a) phrases b) colonne c) paragraphes d) lignes

55. échapper

Dans les pays où il y a la justice, personne ne peut _____ la loi.

- a) éviter b) fuir c) rejeter d) échapper à

Même :

On dit que l'eau et l'air sont incolores, mais en réalité ils n'ont pas _____ couleurs puisque l'un est visible et l'autre ne l'est pas.

- a) les mêmes b) de différentes c) de véritables d) des semblants

Croire :

Même si les Français aimeraient _____ au père Noël, ils comprennent que ce n'est pas de ce côté qu'on trouvera la solution à tous les problèmes.

- a) parler b) croire c) demander d) penser

Plaire :

Les femmes portent de la fourrure des animaux pour _____ hommes.

- a) se moquer des b) ressembler aux c) plaire aux d) attirer les

Plutôt :

A Paris les riches habitent _____ le centre que la banlieue comme c'est le cas ici aux Etats-Unis

- a) rarement b) peut-être c) jamais d) plutôt

Laisser :

Moi, je trouve qu'il faut _____ une langue évoluer. C'est normal qu'une langue emprunte quelques mots d'une autre

- a) laisser b) accepter c) permettre à d) empêcher à

Les gens :

Lors du lancement de la New Beetle, les dirigeants de Volkswagen se sont défendus de viser une génération particulière d'acheteurs, affirmant s'adresser "à tous _____ optimistes".

- a) les acheteurs b) les gens c) personnes d) clients

B. collocations

3. se plaindre

C'est homme n'est jamais satisfait de ce qu'il fait. Il _____ toujours d'avoir mal accompli sa tâche.

- a) se plaint b) se plaint c) se rappelle d) se gêne.

4. être fatigué

Ces soirs-là, il faisait semblant d' _____ dans le but de se coucher après avoir diné.

- a) être content b) être satisfait c) être énervé d) être fatigué

5. faire mourir

Les enfants de Mr Peltier se comportent très mal vis-à-vis de leur père qui, seul, travaille pour la survie de toute la famille. Sa famille risque de _____

- a) le faire travailler davantage b) le rendre malade c) le faire mourir d) le faire vieillir

7. être rendu

La nouvelle bonne des Peltier ne cesse de répéter « je suis rendue ». Elle veut certainement dire qu'elle _____

- a) a rendu tout le service qu'on lui demande b) a transformé le mode de vie de la famille c) est devenue plus laborieuse d) est dépassée par les tâches et les problèmes

10. nuit profonde

Les heures tardives de la nuit peuvent être qualifiées de _____

- a) effrayantes b) profondes c) riches d) reposantes

30. grandes divisions

Ce qui est difficile en Arithmétique _____

- a) ce sont les grandes divisions b) c'est l'addition c) c'est la soustraction d) c'est la multiplication.

33. par-dessus tout

En général, les enfants d'aujourd'hui aiment les jeux vidéo _____ tous les autres jeux.

- a) par-dessus b) autant que c) pas autant que d) aussi bien que

35. emballer

Les histoires qui emballent sont celles qui sont vraiment _____

- a) très faciles à comprendre b) difficiles à comprendre c) tristes d) agréables

42. vaut mieux

Entre voyager très cher en avion et traîner sur la route en voiture personne d'autre ne vous dira ce qui _____ pour vous. C'est un choix personnel

- a) facilite la tâche b) vaut mieux c) convient d) crée des difficultés

44. se battre

Pour mieux réussir dans la vie, il faut _____ pour surmonter les difficultés.

- a) battre constamment b) se battre constamment c) faire des efforts constants
d) baisser les bas

66 Du reste : Locution adverbiale.

- a) en plus de cela, Plus qu'il n'est nécessaire pour ce dont il s'agit.

Une suspension des importations de médicaments et d'aliments de première nécessité a peu de chances d'être votée par le Congrès, et elle n'est _____ pas souhaitable car, depuis 1992, le besoin est plus important d'un jour à un autre.

- a) heureusement b) du reste c) réellement d) toujours

C. Lexical phrases/ idioms

18. recevoir une croix

Ricky Martin va _____ le prix de la personnalité de l'année de la Latin Recording Academy la semaine prochaine.

- a) acheter b) vendre c) recevoir d) accepter

21. Une conjonction de subordination

Une conjonction de subordination _____

- a) met un subordonné dans une situation conjoncturelle b) facilite l'analyse d'une phrase c) complique l'analyse d'une phrase d) lie deux propositions

22. complément d'objet indirect

Lorsque l'action d'un verbe porte sur un mot ou une expression sans préposition, ce mot ou cette expression est le plus souvent _____

- a) complément circonstanciel b) complément d'objet indirect c) complément d'objet direct d) attribut du sujet

24. Plus un devoir était long, plus j'étais contente

Notre professeur de français veut que tous les étudiants travaillent sans arrêt. Il nous donne alors beaucoup de _____ chaque jour.

- a) textes b) devoirs c) problèmes d) lecture

Contente

Je suis _____ parce qu'il va y avoir la fête.

- a) prêt b) fatigué c) mécontent d) content

27. les cinq petites lignes

Notre quartier est bien desservi par les autobus. Il y a plusieurs véhicules sur chaque _____

- a) station b) ligne c) arrêt d) point d'embarquement

32. les règles de trois

Pour calculer les pourcentages de façon précise, on emploie _____

- a) la règle de trois b) les règles d'arithmétique c) la règle de multiplication d) la règle de division

38. pas la peine

Lorsqu'on se trouve dans une situation qui n'est pas très compliquée, cela ne _____ de paniquer.

- a) suffit pas b) ne vaut pas la peine c) n'est pas important d) n'importe pas

43. être dans les moyennes

Un élève qui n'est ni très fort ni très faible _____

- a) est en retard b) est en avance c) est dans les moyennes d) est en tête

46. ça m'est égal

Lorsqu'on n'a pas de préférence pour une chose pour laquelle un avis est demandé, la réponse appropriée mais qui peut être impolie serait de dire _____

- a) les choix sont les mêmes b) je n'ai pas d'avis c) je ne peux pas répondre à cette question d) ça m'est égal

49. un coup de veine

Pour dire que quelqu'un s'est retrouvé dans une situation quelconque par coup de chance, on peut aussi employer l'expression _____ peut être interprétée comme

- a) un coup de vent b) un coup de veine c) un coup de foudre d) coup de main

51. mettre sous le nez

Lorsqu'un enfant veut absolument faire voir quelque chose à quelqu'un, il n'hésite pas de la lui _____. a) remettre b) présenter c) mettre sous le nez d) mettre sous la dent

52. ce coup-là

Lorsqu'elle disait « _____ j'en étais sûre », la jeune fille voulait dire qu'à l'occasion qu'elle avait mentionnée, elle était convaincue que sa moyenne de classe n'allait pas échapper à son père.

- a) en ce moment b) à cette occasion c) ce coup-là d) dans ces circonstances

58. je m'en fou

Lorsque quelqu'un dit « je m'en fou » il veut signifier son _____ par rapport à cette chose.

- a) indifférence b) manque de respect c) respect d) mépris

De toute façon :

La dame a obligé sa fille de finir ses exercices avant d'aller au lit. _____ elle devait faire ce travail puisqu'il ne lui restait que quelques heures pour le rendre à son institutrice.

- a) en aucune façon b) de toute façon c) de cette façon d) sans aucune façon

Dans l'ensemble :

Lorsqu'une situation n'est ni bonne ni mauvaise, on peut aussi dire qu'elle est moyenne _____. a) et régulière b) dans l'ensemble c) et bonne d) et précise

61 Au cas où

Demander des renseignements précis avant votre départ _____ vous devez voyager vers une destination nouvelle pour vous.

- a) dans ce cas b) lorsque c) puisque d) au cas où

64 Ah bon :

Interjection servant à exprimer la douleur, la surprise, l'admiration, etc.

Je me suis facilement rendu compte que M. Lambert était surpris d'apprendre la nouvelle du voyage de son ami puisqu'il a dit _____

a) c'est vrai. b) c'est ainsi c) ah bon ! d) c'est la réalité.

65 Point c'est tout :

La réponse de l'agent de police au conducteur ivre était claire. Il lui a dit : « vous conduisiez en état d'ivresse. Ne discutez plus, monsieur. Vous êtes en état d'arrestation, _____ ! » a) Taisez-vous b) ne parlez plus c) point c'est tout d) voilà

67 Se foutre de quelque chose:

Se foutre de quelque chose c'est _____ a) respecter cette chose b) ne pas respecter cette chose c) considérer cette chose d) ne pas considérer cette chose

APPENDIX D: RECALL PROTOCOL

(Data collection instrument 2)

Write down as much information as you remember from the story. Submit your work to your instructor

Assessment rubric for grading the comprehension recall exercise:

1	The idea/ expression/ meaning is conveyed: - as was done in the original text; -differently but appropriately; -with the exact meaning	1
2	The word forms and phrases are used but the idea/expression/meaning is conveyed: -not very appropriately; -not very clearly	.75
3	The idea/expression/meaning is: - apparent in the production - is conveyed with some appropriateness	.50
4	The idea/expression/ meaning: -is hardly conveyed -is unintelligible.	.25
5	The idea/expression/ meaning is not mentioned at all	0

APPENDIX E : POST-READING QUESTIONNAIRE

Participant's code: _____

Please read carefully and respond to the following**I. The program:****Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.***Underline the appropriate number in each line to specify the degree at which each situation applies.***A. This vocabulary program is:**

- | | |
|----------------|---------|
| a. Effective. | 1 2 3 4 |
| b. Interesting | 1 2 3 4 |
| c. Easy | 1 2 3 4 |
| d. Helpful | 1 2 3 4 |
| e. Enjoyable | 1 2 3 4 |

B. This vocabulary program helps:

- | | |
|---|---------|
| a. comprehension and memorization | 1 2 3 4 |
| b. comprehension but not memorization | 1 2 3 4 |
| c. memorization but not comprehension | 1 2 3 4 |
| d. neither memorization nor comprehension | 1 2 3 4 |

C. What helped me to understand the new vocabulary were/was:

- | | |
|---|---------|
| a. my efforts to understand the story | 1 2 3 4 |
| b. the highlighting of the new vocabulary | 1 2 3 4 |
| c. the additional help provided | 1 2 3 4 |
| d. my desire to learn French | 1 2 3 4 |

II. Reading and vocabulary learning

1). *Please rate the difficulty of the text for comprehension and vocabulary learning.*
(Please check the appropriate box in each line)

	1 very easy	2 slightly easy	3 neither easy nor difficult	4 slightly difficult	5 very difficult
Comprehension					
Vocabulary					

2). Was there enough time to read and answer the questions?

3). Do you think reading an electronic text is different from reading a text from a paper source? How?

4). Do you prefer reading from an electronic text or a paper source? Why?

5). Was moving through the text easy or difficult? Why?

6). Was moving to and from the text and the different sources of additional information difficult? Why?

7. Did the navigation map in the top left corner help you at all?

8). How much of the content was new to you?

9). How much of the vocabulary was new to you?

III. Additional information:

1). Additional information and text comprehension

Please, rate the usefulness of the following in helping you to comprehend the text.

	1 very easy	2 slightly easy	3 neither easy nor difficult	4 slightly difficult	5 very difficult
The English definitions					
Sound					
Graphics					

2). Additional information and vocabulary acquisition

(Please, rate the usefulness of the following in helping you to learn new vocabulary?)

	1 very easy	2 slightly easy	3 neither easy nor difficult	4 slightly difficult	5 very difficult
The English definitions					
Sound					
Graphics					

Thank you for your participation

Adapted from Ercetin (2001)

APPENDIX F : EXIT QUESTIONNAIRE

Exit questionnaire :

Participant's code : _____

Fall 06

Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.

(Circle the appropriate number in each line.)

Read the instructions thoroughly and answer the questions

I. The program:**A. This vocabulary activity allowed me to learn:**

- | | | | | |
|----------------------|---|---|---|---|
| a. a great deal; | 1 | 2 | 3 | 4 |
| b. more than usual; | 1 | 2 | 3 | 4 |
| c. as much as usual; | 1 | 2 | 3 | 4 |
| d. less than usual; | 1 | 2 | 3 | 4 |

B. The program is:

- | | | | | |
|-------------------------------------|---|---|---|---|
| a. beneficial and enjoyable | 1 | 2 | 3 | 4 |
| b. beneficial but not enjoyable | 1 | 2 | 3 | 4 |
| c. not beneficial but enjoyable | 1 | 2 | 3 | 4 |
| d. neither beneficial nor enjoyable | 1 | 2 | 3 | 4 |

II. Comprehension:**A. Comprehending the story facilitated:**

- | | | | | |
|--|---|---|---|---|
| a. comprehension of new vocabulary | 1 | 2 | 3 | 4 |
| b. retention of the new vocabulary | 1 | 2 | 3 | 4 |
| c. comprehension and retention of new vocabulary | 1 | 2 | 3 | 4 |
| d. neither comprehension nor retention of new vocabulary | 1 | 2 | 3 | 4 |

B. Studying the vocabulary in focus facilitated:

- | | | | | |
|--|---|---|---|---|
| a. comprehension of the new vocabulary | 1 | 2 | 3 | 4 |
| b. retention of the new vocabulary | 1 | 2 | 3 | 4 |
| c. both comprehension and retention | 1 | 2 | 3 | 4 |
| d. neither comprehension nor retention | 1 | 2 | 3 | 4 |

III. Retention:**A. Of the new vocabulary contained in the text, I memorized:**

- | | | | | |
|----------------------|---|---|---|---|
| a. a great deal; | 1 | 2 | 3 | 4 |
| b. more than usual; | 1 | 2 | 3 | 4 |
| c. as much as usual; | 1 | 2 | 3 | 4 |

d. less than usual; 1 2 3 4

B. I memorized the new vocabulary by:

- a. trying to understand the story 1 2 3 4
 b. trying to understand the highlighted new vocabulary 1 2 3 4
 c. consulting the different types of additional information 1 2 3 4
 d. using my own memory strategies 1 2 3 4
 e. by combining more than one of the above (specify) 1 2 3 4

IV. The additional information

Rate the usefulness of the following in helping you to retain the new vocabulary by checking the appropriate box in each of the lines below.

	1 very easy	2 slightly easy	3 neither easy nor difficult	4 slightly difficult	5 very difficult
The English definitions					
Sound					
Graphics					

V. Final comments

- a. The text comprehension activities facilitated vocabulary retention 1 2 3 4
 b. The vocabulary learning activities facilitated vocabulary retention 1 2 3 4
 c. I like this vocabulary program 1 2 3 4
 d. I like the activities 1 2 3 4
 e. The time spent on these activities was beneficial 1 2 3 4
 f. My performance on this quiz was better than usual 1 2 3 4

VI. Vocabulary readiness

Do you think that you are ready to use some of the newly encountered words and phrases in your communication from now on? Explain.

VII. Your suggestions:

Thank you for your contribution!

Adapted from Ercetin (2001)

APPENDIX G: MOTIVATION CATEGORIES AND CODING

Background questionnaire:

Participant code: _____

II. Personal information

Nationality:

Age:

Gender:

II. Language background

1). First language:

2). Other languages:

	Names of languages by order of fluency	Length of study
a)		
b)		
c)		
d)		
e)		

3). Purpose for learning French: ____ (Like=intrinsic (2); job/travel related=instrumental (3); requirement=requirement (4); combination=intrinsic and instrumental (1) _____

5). How would you describe your level of French?

____ Positive=instrumental; neutral=intrinsic; negative=requirement _____

6). If you are planning to study French beyond this course, will it be your major or minor?

____ Major=intrinsic; minor=instrumental _____

7). How often do you communicate in French?

____ Often=intrinsic; rarely=instrumental; never outside of class=requirement _____

8). How often do you read books related to French culture?

____ Often=intrinsic; rarely=instrumental; never outside of class=requirement _____

9). How many hours per week do you use the World Wide Web on average to learn or practice your French?

____ 0-1 hour=requirement; 2hours-3hours = instrumental;
3hours+=intrinsic _____

10). How many hours do you watch francophone TV per week?

____ 0-1 hour=requirement; 2hours-3hours = instrumental; 3hours+=intrinsic _____

11). How many hours do you listen to French language radio programs?

____ 0-1 hour=requirement; 2hours-3hours = instrumental; 3hours+=intrinsic _____

III. Learning foreign languages

Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.

1=intrinsic; 2=intrinsic and instrumental; 3=instrumental; 4=requirement

Underline the appropriate number in each line.

- | | |
|--|---------|
| a). Learning foreign languages is fun | 1 2 3 4 |
| b) Knowing a foreign language guarantees a better future | 1 2 3 4 |
| c). I enjoy reading foreign language texts | 1 2 3 4 |
| d). I like to acquire foreign cultural knowledge | 1 2 3 4 |
| e). Learning Foreign culture is an advantage | 1 2 3 4 |
| f). Learning French culture is fun | 1 2 3 4 |

IV. Learning foreign language vocabulary

Rubric: 1= very much; 2 = much; 3 = not much; 4 = not at all.

1=intrinsic; 2=intrinsic and instrumental; 3=instrumental; 4=requirement (for lines a, b, c, d)

4=intrinsic; 3=intrinsic and instrumental; 2=instrumental; 1=requirement

Underline the appropriate number in each line.

- | | |
|--|---------|
| a) It is fun to learn foreign language vocabulary | 1 2 3 4 |
| b) It is necessary to learn foreign language vocabulary | 1 2 3 4 |
| c) Foreign language vocabulary is as important as foreign language grammar | 1 2 3 4 |
| d) Foreign language vocabulary is more important than grammar | 1 2 3 4 |
| e) Foreign language grammar is more important than vocabulary | 1 2 3 4 |

APPENDIX H: CODING SHEET

Treatment group:

Implicit condition:	(Impl) = 1
Explicit condition:	(Expl) = 2

A summary of codes used with the different variables in the study:

Instruments	
Reading time:	RTime
Gloss type:	GlossT
Immediate test scores:	ImTest
Delayed test scores:	DelTest
Comprehension test scores:	CompScores

Variables: **Exhaustive gloss categories and numeric codes**

Not recorded	NotRec = 00
Textual annotation	Txt = 1
Graphic annotation	Graph = 2
Auditory annotation	Aud = 3
Textual and graphic annotations	txtGraph = 4
Textual and audio annotation	txtAud = 5
Graphic and audio annotation	GraphAud = 6
Textual, graphic, and audio annotation	TxtGraphAud=7
No information available	NoInfo = 8

Summarized demographic variables

Variables	Codes
Gender:	Male: M = 1
	Female: F = 2
Years of French study	0-2 years = 1
	3-4 years = 2
	5years and more = 3
Motivation to take FREN202 (MotiFren)	Intrinsic + instrumental mot. (IntrInstrum) = 1
	Intrinsic only (Intrins.) = 2
	Instrumental only (Instrum.) = 3
	University requirement (Req) = 4
Attitude toward vocabulary learning	Positive = 1; Neutral = 2; Negative = 3
Self-perception	Positive = 1; Negative = 2
Actual use of French	Reading, video and audio in class only = 1
	Reading, video and audio in class and sometimes elsewhere = 2
	Reading, video and audio beyond the class = 3

APPENDIX I: UNITS OF IDEAS AND RUBIC FOR THE COMPREHENSION TASK

Main points:

1. The Little Children of the Century

2. I recovered my kitchen and opened my notebook.
3. For a moment I heard mother complain, not far away: Oh my!
4. How tired I am, oh, my! I can really be tired,
5. They will make me die: these kids will make me die,
6. I am beat, oh my!
7. My god, I can really be tired;
8. saying it is nothing, oh my!
9. My god how tired I am.
10. The father's snoring was already perceptible in the deep night.
11. The bedsprings squeaked. She was rejoining bed.
12. Sigh. Silence. Relief. Peace.
13. "The handkerchief that you gave me when I received the cross is white."
14. "The handkerchief is white" main clause;
15. "the," definite article;
16. "handkerchief" common noun, masculine singular, subject of "is;"
17. "is," verb (to be). Third person singular, present indicative;
18. "white," adjective, masculine singular; predicative of "handkerchief;"
19. "that you gave me." subordinate clause, complement of "handkerchief;"
20. "that," subordinate conjunction;"
21. "you," personal pronoun, second person singular, subject of "gave;"
22. "me," personal pronoun, 1st person singular, indirect object of "gave."
23. The longer a homework was, the happier I felt.
24. The pen scratched, in silence.
25. I liked that. I liked the pen, the paper, and even the five small lines in which the letters had to be written,
26. and the most annoying activities, the great divisions, the rule of three,
27. and I liked over all the grammatical analysis. This way of doing excited me.
28. The other girls used to say that it was of no use.
29. That did not bother me.
30. I even believe that the more useless it was, the best it pleased me.
31. I would have really spent my life to do nothing but useless tasks.
32. "Has," verb, to have, 2nd person singular, auxiliary of "give;"
33. "given," verb, to give, past participle.
34. The teacher used to say: "It is not worthwhile to put so much of it, Josyane;"
35. rather try not to leave thoughtlessness in it; that will be better."
36. As for mistakes, I used to make many,
37. but in the end I had rather averages results;
38. I did not try to fight to be the best anyway.
39. I was not interested in that. Why be the best?

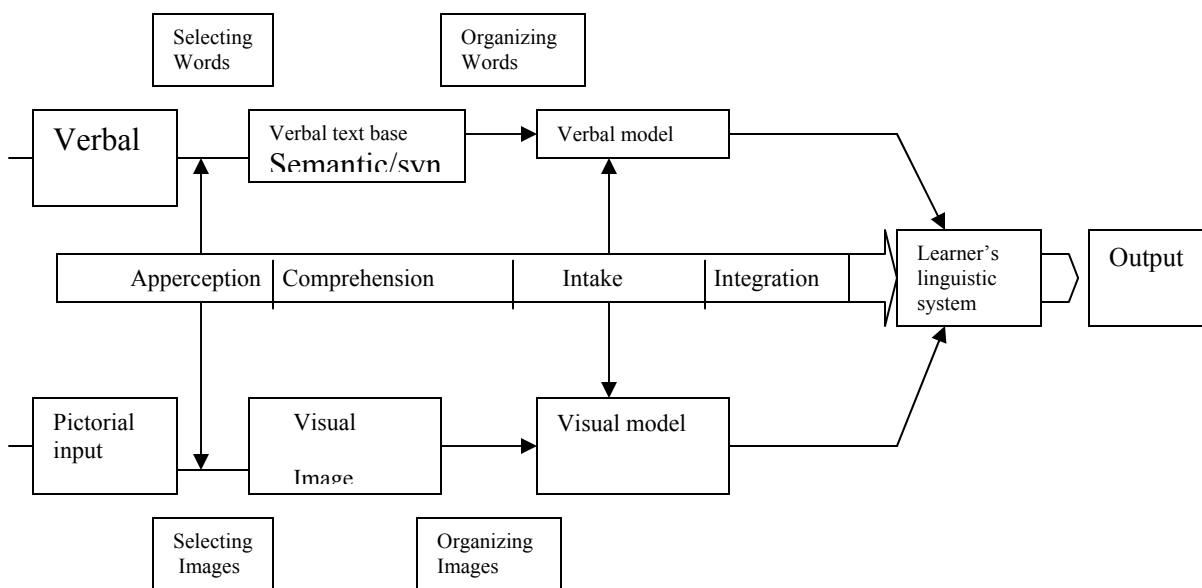
40. Over all, I did not mind what people thought of me.
41. The teacher had written in the booklet: "Indifferent to compliments as well as reproaches,"
42. but as nobody had ever looked at this booklet, she could as well have written "it is spring," or Toto likes Zizi, or this girl is a noodle, that would not have made a difference.
43. Once, in the class before, I had been the third best student; one does not know why,
44. a stroke of luck,
45. all the others had to be sick;
46. I had put the booklet under the nose of dad on that occasion.
47. He had looked at it and had returned it to me while saying "Oh! Good."
48. Just in case he missed the column I said: "I am the third"
49. That gave: "Oh! Good." Period.
50. Moreover, I didn't care about what he could say.

APPENDIX J: ROBY'S TAXONOMY OF GLOSSES

- I. Gloss authorship
 - A. Learners
 - B. Professionals
 - 1. Instructors
 - 2. Materials developers
 - II. Gloss presentation
 - A. Priming
 - B. Prompting
 - III. Gloss functions
 - A. Procedural
 - 1. Metacognitive
 - 2. Highlighting
 - 3. Clarifying
 - B. Declarative
 - 1. Encyclopedic
 - 2. Linguistic
 - a. Lexical
 - i. Signification
 - ii. Value
 - b. Syntactical
- IV. Gloss focus
 - A. Textual
 - B. Extratextual
- V. Gloss language
 - A. L1
 - B. L2
 - C. L3
- VI. Gloss form
 - A. Verbal
 - B. Visual
 - 1. Image
 - 2. Icon
 - 3. Video
 - a. With sound
 - b. Without sound
 - C. Audio (only)

Taxonomy of glosses by Roby (1999) p. 96

APPENDIX K: INTEGRATED MODEL OF SECOND LANGUAGE ACQUISITION

WITH MULTIMEDIA (*Plass and Jones, In Mayer, 2005 p. 471*)

APPENDIX L: ANNOTATION TYPES USED BY DIFFERENT RESEARCHERS

Researcher	Types of enhancements used for the study
Al-Seghayer (2001)	Printed text Graphics (static image) Video (dynamic video) Sound
Chun and Plass (1996b)	Text only (definitions) Text and pictures Text and video
Davis and Lyman Hager (1997)	English definitions French definitions Grammar explanations Pronunciation Cultural background Pictures
Laufer and Hill (2000)	Reading text Meaning in English Translation into L1 Pronunciation Root Extra information
Plass and Jones (2005)	Translations, Descriptive sentences, Background information, Pronunciation guides, Images, Video
Roby (1999)	A magazine article to read on paper or on the computer Paper dictionary Paper dictionary and glosses Computer dictionary Computer dictionary and glosses

Yoshii and Flaitz (2002)	Text (definition of key words) Picture Text and picture
Hulstijn 1992	Reading Synonyms Definitions Translations Multiple-choice glosses
Watanabe 1997	Within-text appositional explanations Single marginal annotations Multiple-choice marginal annotations
Ercetin 2003	Textual text (dictionary definition of words) Textual audio (pronunciation of words) Textual graphics (images for word meanings) Contextual audio (additional information about the text in the form of the text) Contextual graphics (images providing additional information about the topic) Contextual video (movies with additional information on the text)
Grace 1998	Color graphics Dialogue text Audio text Hyperlinks with accessing L2 definitional sentences
Lomicka (1998)	Text alone Text with traditional glosses (definitions in French and translations in English) Text with multimedia glosses (definitions in French, images, references, questions, pronunciation, translation in English)
De Ridder (2002)	Visible hyperlinks Invisible hyperlinks L1 definitions (Dutch) in pop-up textboxes L2 definitions (French) in pop-up textboxes

APPENDIX M: RECRUITMENT MATERIAL

Text of the oral communication delivered to the FREN202 students (Fall 2006)

Dear FREN202 students,

My name is Hassan Mahamat Souleyman and I am a Ph.D. Candidate in Second Language Acquisition and Teaching at the University of Arizona. I am also A Graduate Associate in Teaching at the Department of French and Italian where I teach French. I am pleased to announce to every one of you in that I am interested in studying on the teaching of foreign language with the help of technology for my dissertation research, using two slightly different methods. I am interested in finding out which of the two methods is more efficient and beneficial to intermediate learners of French as a foreign language. The name of the study is "Language Acquisition with a Computer-Assisted Hypertext Reading Task."

The project uses materials mostly from your coursework and the whole class will be doing these activities as part of your classroom practice. Beside your involvement into your class work, I am inviting you all to participate in the study by filling out three short questionnaires and taking an additional 10-minute test. I am inviting you to give me your voluntary written consent to use your production for the study you choose to do so. You do not have to. I am just inviting you to contribute. Again, your participation is voluntary and you may withdraw from the study any time before December 10, 2006, a date after which it will no longer be possible to distinguish your data from the rest. In this task, you will read a text on the computer after a 5-minute language background survey. You will then access additional information to help you perform better. When you finish the task, you will take a 10-minute test to check your performance. If you agree to participate in the study, you will also fill out a 10-minute post-reading questionnaire and a 10-minute exit questionnaire, the first one following the immediate post-test and the other approximately four weeks later. The total activities will take 1 hour and 30 minutes, but only 45 minutes are specific to the study. The first 1 hour part is your regular classroom practice. The activities will take place at your regular hours of class, but in the computer laboratory of the College of Humanity, Room 511 in the Modern Languages Building.

I am giving you each a copy of the consent form with more details and for you to take home and study it very closely in order to decide whether you want to participate in the study or not. Your consent form should be signed and returned to me if you do choose to participate. If you do, I will ask you to return the signed form to either my box in the Secretary of the Department of French on your left when you enter the office, or slide it under the door of room 306 on the third floor of the Main Library. On the consent form are my telephone number and email contact. You can call or email me with your questions and it will be my pleasure to give you the information you need.

Thank you for your attention

Hassan Mahamat Souleyman

Ph.D. Candidate in Second Language Acquisition and Teaching
University of Arizona
Tucson, AZ 85721

REFERENCES

- Ahmed, M.O. (1989). 'Vocabulary learning techniques.' In P. Meara (Ed.) *Beyond Words* 3-14, London: CILT.
- Al-Seghayer, K. (2001). "The effects of multimedia annotation modes on L2 vocabulary acquisition: A comparative study". *Language Learning and Technology*, 5, 202-232.
- Ariew, R. & Ercetin, G. (2004). Exploring the Potential of Hypermedia Annotations for Second Language Reading. *Computer Assisted Language Learning*, 17(2), 237-259.
- Bachman, L. F. & Palmer, A. S. (1996). *Language Testing in Practice*. Oxford: Oxford University Press.
- Baddeley, A. (1992). Working memory. *Science*, 255, 556-559.
- Bax, S. (2003). CALL—past, present and future. *System*, 31, 13–28
- Beaton, A., Gruneberg, M., & Ellis, N. (1995). "Retention of foreign language vocabulary learned using the key-word method: A ten-year follow-up". *Second Language Research*, 11(2) 112-120.
- Bensoussan, M. & Laufer, B. (1984). Lexical Guessing in Context in EFL Reading Comprehension. *Journal of Research in Reading*, 7 (1): 15-32
- Bernhardt, E. B. (1991). *Reading development in a second language: Theoretical, empirical, and classroom perspectives*. Norwood, NJ: Ablex Publishing.
- Bogaards, P. (1991), Dictionnaires pédagogiques et apprentissage du vocabulaire. *Cahiers de Lexicologie* 59, 93-107.
- Bogaards, P. (2001). "Lexical units and the learning of foreign vocabulary". *Studies in Second Language Acquisition*, vol. 23, 3. pp. 321-343.
- Brown, C. (1993). Factors affecting the acquisition of vocabulary: Frequency and saliency of words. In T. Huckin & M. Haynes & J. Coady (Eds.), *Second language reading and vocabulary learning*. Norwood, N.J.: Ablex.
- Chamot, A. U. & O'Malley, J. M. (1994). Language learner and learning strategies. In N. C. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 371-392). London: Academic Press.

- Chandler and Sweller (1991). Cognitive Load Theory and the Format of Instruction. *Cognition and Instruction*, 8, 293-332.
- Chapelle, C (1998). Multimedia CALL: Lessons to be learned from research on SLA. *Language Learning and Technology*, 2 (1), 22-34.
- Chapelle, C. A. (2001). *Computer applications in second language acquisition: Foundations for teaching testing and research*. NY: Cambridge University Press.
- Cho, K., & Krashen, S. (1994). Acquisition of vocabulary from Sweet Valley High Series: Adult ESL Acquisition. *Journal of Reading*, 37, 662-667
- Chodkiewicz, H. (2001). The acquisition of word meanings while reading in English as a foreign language. In S. Foster-Cohen & A. Nizegorodcew (Eds.), *EUROSLA Yearbook* (pp. 29-50). Philadelphia: John Benjamins.
- Coady, J. (1997). L2 vocabulary acquisition through extensive reading. In J. Coady & T. Huckin (Eds.), *Second language vocabulary acquisition* (pp. 225-237). Cambridge: Cambridge University Press.
- Coady, J. (1993). Research in ESL/EFL vocabulary acquisition: Putting it in context. In T. Huckin, M. Haynes, & J. Coady (Eds.), *Second language reading and vocabulary learning* (pp. 3-23). Norwood, NJ: Ablex.
- Cohen, A. (1990). *Language Learning: Insights for Learners, Teachers, and Researchers*. New York : Newbury House/Harper Row.
- Chun, D. M., & Plass, J. L. (1996). Effects of multimedia annotations on vocabulary acquisition. *The Modern Language Journal*, 80, 183-198.
- Chun, D. M. & Plass, J. L. (1997). "Research on text comprehension in multimedia environments". *Language Learning & Technology*, 1(1), 60-81.
- Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671-684.
- Craik, F. I. M., & Tulving, E. (1975). Depth of processing and the retention of words in episodic memory. *Journal of Experimental Psychology*, 104, 268-294.
- Day, R., Omura, C., & Hiramatsu, M. (1991). Incidental EFL vocabulary learning and reading. *Reading in a Foreign Language* 7 (2), 541-9.
- DeKeyser, R. (2003). Implicit and explicit learning. In C. Doughty & M. Long (Eds.), *The handbook of second language acquisition*. London: Blackwell.

- DeKeyser, R. (1994). How implicit can adult second language learning be? In J. Hulstijn & R. Schmidt (Eds.), *Consciousness in second language learning* (pp. 83—96): *AILA Review*, 11, 19(2), 249—297
- De Ridder, I. (2002). "Visible or invisible links: Does the highlighting of hyperlinks affect incidental vocabulary learning, text comprehension, and the reading process?" *Language Learning & Technology*, 6 (1), 123-46.
- Dörnyei, Z. (2000). Motivation in action: Toward a process-oriented conceptualization of student motivation. *British Journal of Educational Psychology*, 70, 519—538.
- Dörnyei, Z. (2001). *Teaching and researching motivation*. London: Longman.
- Dörnyei Z. (2003a). Attitudes, orientations, and motivations in language learning: Advances in theory, research, and applications. In Z. Dörnyei (Ed.), *Attitudes, orientations, and motivations in language learning: Advances in theory, research, and applications* (pp. 3–32). Oxford, UK: Blackwell.
- Dörnyei, Z. (2003b). *Questionnaires in second language research: Construction, administration, and processing*. Mahwah, NJ: Erlbaum.
- Doughty, C. (1991). Second language instruction does make a difference: evidence from an empirical study of SL relativization. *Studies in Second Language Acquisition*, 13, 431-469.
- Doughty, C., Williams, J., 1998. Pedagogical choices in focus on form. In: Doughty, C., Williams, J. (Eds.), *Focus on Form in Classroom Second Language Acquisition*. Cambridge University Press, Cambridge, pp. 197–261.
- Dufour, M.J. (1997). *Foreign Language Vocabulary Acquisition: Two Methods Compared*. Unpublished master's thesis, Universiteit Utrecht, Faculty of Letters, The Netherlands. In Groot, P. J. M. (2000). "Computer assisted second language vocabulary acquisition". *Language Learning and Technology*, 1, 60-81.
- Dupuy, B. and Krashen, S. (1993). Incidental vocabulary acquisition in French as a Foreign Language. *Applied Linguistics*, 4, 55-63.
- Ellis, N. (1994). Vocabulary acquisition: The implicit ins and outs of explicit cognitive mediation. In N. C. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 211-282). London: Academic Press.
- Ellis, N. C. (2006). Selective attention and transfer phenomena in L2 acquisition:

contingency, cue competition, salience, interference, overshadowing, blocking, and perceptual learning. *Applied Linguistics*, 27, 164-194.

- Ellis, N. & Beaton, A. (1993a). Factors affecting the learning of foreign language vocabulary: Imagery keyword mediators and phonological short-term memory. *Quarterly Journal of Experimental Psychology*, 46A, 533-558.
- Ellis, N. & Beaton, A. (1993b). Psycholinguistic determinants of foreign language vocabulary learning. *Language Learning*, 43, 559-617.
- Ellis, R. & He, X. (1999). The roles of modified input and output in the incidental acquisition of word meanings. *Studies in Second Language Acquisition* 21, 285–301.
- Erçetin, G. (2001). Second Language Reading in a Hypermedia Environment: The Role of Proficiency, Annotation Use, Text Format, and Prior Knowledge. *Unpublished Ph.D. Dissertation, University of Arizona, Tucson, Arizona.*
- Erçetin, G. (2003). Exploring ESL learners' use of hypermedia reading glosses. *CALICO Journal*, 20(2), 261-284.
- Finkbeiner, M & Nicol, J (2003). Semantic category effects in second language word learning. *Applied Psycholinguistics*, 24, pp. 369-383
- Fraser, C. (1999). Lexical processing strategy use and vocabulary learning through reading. *Studies in Second Language Acquisition*, 21 (2), 225-241.
- Gairns, R. & Redman, S. (1986). Working with words: a guide to teaching and learning vocabulary. Cambridge: CUP.
- Gardner, R. (1985), *Social Psychology and Second Language Learning*, London, Edward Arnold
- Giora, R. (1997). Discourse coherence and theory of relevance: Stumbling blocks in search of a unified theory. *Journal of Pragmatics* 27, pp. 17–34.
- Goodfellow, R. & Laurillard, D. (1994). Modeling learning processes in lexical CALL. *CALICO Journal*, 11(3), 19-46.
- Goodman, K. (1967). Reading: A psycholinguistic guess game. *Journal of the Reading Specialist*, May, 126-135.

- Grace, C. (1998). Retention of word meanings inferred from context and sentence-level translations: implications for the design of beginning-level CALL software. *The Modern Language Journal*, 82 (4), 533-544.
- Groot, P. J. M. (2000). "Computer assisted second language vocabulary acquisition". *Language Learning and Technology*, 4 (1), 60-81.
- Guettys, S., Imhof, L., & Kautz, J. (2001). Computer-assisted reading: The effect of glossing format on comprehension and vocabulary retention. *Foreign Language Annals*, 34 (2), 91-106.
- Hermann, F. (2003). Differential Effects of Reading and Memorization of Paired Associates on Vocabulary Acquisition in Adult Learners of English as a Second Language. *TESL-EJ*.
- Horst, M, Cobb, T., & Meara P. (1998). Beyond A Clockwork Orange: Acquiring second language vocabulary through reading. *Reading in a Foreign Language 11* (2), 207-223.
- Huckin, T. & Coady, J. (1999). Incidental vocabulary acquisition in a second language. *Studies in Second Language Acquisition*, 21, 181-193.
- Huitt, W. (2003). The Information Processing Approach to Cognition. Educational Psychology Interactive, Valdosta, GA: Valdosta State University. Retrieved 05/05/05 from, <http://chiron.valdosta.edu/whuitt/col/cogsys/infoproc.html>.
- Hulstijn, J. H., Hollander, M., & Greidanus, T. (1996). Incidental vocabulary learning by advanced foreign language students: The influence of marginal glosses, dictionary use, and reoccurrence of unknown words. *The Modern Language Journal*, 80, 327-339.
- Hulstijn, J (1992). Retention of inferred and given word meanings: Experiments in incidental vocabulary learning. *Vocabulary and applied linguistics*. Macmillan
- Hulstijn, J (2001). Intentional and Incidental Second Language Learning: A Reappraisal of Elaboration, Rehearsal and Automaticity. In *Cognition and second language instruction*. Cambridge University Press. Ch. 10.
- Hulstijn, J. and Graaff, R. (1994). Under what conditions does explicit knowledge of a second language facilitates the acquisition of implicit knowledge? A research proposal. In *Aila Review* #11, 97-112
- Hulstijn, J. (2000). The use of computer technology in experimental studies of second

- language acquisition. *Language Learning and Technology* 3, 2, pp32-43
- Hulstijn, J. (2003). Incidental and Intentional Learning. In *The Handbook of Second Language Acquisition*. Doughty & Long (Eds) Malden, MA USA: Blackwell. (pp. 349- 381).
- Hulstijn, J. (2005). Theoretical and empirical issues in the study of implicit and explicit second language learning. *Studies in Second Language Acquisition*, 27, 129–140.
- Hunt, A. & Beglar, D. (2005). A framework for developing EFL reading vocabulary. *Reading in Foreign Language*, 17 (1), 23-59.
- Jacobs et al. (1994). What lurks in the margin: Use of vocabulary glosses as a strategy in second language reading. *Issues in Applied Linguistics*, 4(1), 115-137.
- Joe, A. (1995). Text-based tasks and incidental vocabulary learning. *Second Language Research*, 11, 149-158.
- Jones, L. C. (2001). Listening comprehension in multimedia learning: An extension of the generative theory of multimedia learning. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, 62 (2-A), 538.
- Jordan, D. L., & Sanchez, P. M. (1994). “Traditional versus Technology-Aided Instruction: The Effects of Visual Stimulus in the Classroom.” *PS: Political Science and Politics* 27 64–67.
- Knight, S. (1994). Dictionary use while reading: The effects on comprehension and vocabulary acquisition for students of different verbal abilities. *The Modern Language Journal*, 78, 285-299.
- Kintsch, W. (1998) *Comprehension: A paradigm for cognition*. New York: Cambridge University Press.
- Kirsner, K. (1994). Second language vocabulary learning: The role of implicit processes. In N. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 283—311). London: Academic.
- Kost et al. (1999). Textual and pictorial glosses: effectiveness on incidental vocabulary growth when reading in a foreign language. *Foreign Language Annals* 32, 1, 89-113.
- Krashen, S. (1985), *Language Acquisition and Language Education*, Alemany Press, reprinted Prentice-Hall 1989

- Krashen, S. (1989). We acquire vocabulary and spelling by reading: additional evidence for the input hypothesis. *Modern Language Journal*, 73 (4), 440-463
- Laufer, B. (1997). The lexical plight in second language. In J. Coady, & T. Huckin, *Second Language Vocabulary Acquisition* (pp. 20-34). Cambridge: Cambridge University Press.
- Laufer, B. & Hill (2000). What lexical information do L2 learners select in a CALL dictionary and how does it affect word retention? *Language Learning and Technology*, 3(2), 58-76.
- Laufer, B and Hulstijn, J (2001). Incidental vocabulary acquisition in a second language: the construct of task-induced involvement. *Applied Linguistics* 22 (1):1-26.
- Lawson, M. J. & Hogben, D. (1996). The vocabulary learning strategies of foreign language students. *Language Learning*, 46, 101-135.
- Lee, J., & VanPatten, B. (2003). Making communicative language teaching happen, 2nd ed. Boston: McGraw-Hill.
- Lewis, M. (1993), *The Lexical Approach*, Language Teaching Publications, Hove.
- Lewis, M. (1997). *Implementing the Lexical Approach: Putting theory into practice*. Hove, UK: Language Teaching Publications.
- Lomicka, L. (1998). "'To gloss or not to gloss': An investigation of reading comprehension online". *Language Learning and Technology*, (1), 2 41-50.
- Long, M., H. & Robinson, P. (1998). Focus on Form: Theory, Research, and Practice. Chapter 2 (pp. 15-41) in *Focus on Form in Classroom Second Language Acquisition*. Cambridge: Cambridge University Press.
- Long, M. (1991). Focus on form: A design feature in language teaching methodology. In K. de Bot, R. Ginsberg, & C. Kramsch (Eds.), *Foreign language research in cross-cultural perspective* (pp. 39-52). Amsterdam: John Benjamins.
- Long, M. H. (1996). The role of linguistic environment in second language acquisition. In W. C. Ritchie & T. K. Bhatia, (Eds.), *Handbook of second language acquisition* (pp. 413-468). San Diego, CA: Academic Press.
- Lyman-Hager, M., & Davis, J.N. (1996). "The case for computer-mediated reading: Une Vie de Boy". *The French Review*, 69 (5), 775-790.
- Markham, P. (1989). "Effects of contextual versus definitional computer-assisted

vocabulary instruction on immediate and long-term vocabulary retention of advanced ESL students". *Educational Psychology*, 9 (2), 121-126.

- Martinez-Lage, A. (1997). Hypermedia technology for teaching reading. In M. Bush & R. Terry (Eds.), *Technology enhanced language learning* (pp. 121-163). Lincolnwood, IL: National Textbook Company.
- Mayer, E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist*, 32(1), 1-19.
- Mayer, R. E. & Sims, V. K. (1994). For whom is a picture worth a thousand words? Extensions of a dual-coding theory of multimedia learning. *Journal of Educational Psychology*, 86, 389-401.
- Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.
- McLaughlin, B. (1986). Multilingual education: Theory east and west. In B. Spolsky (Ed.), *Language and education in multilingual settings* (pp. 35-52). Clevedon, Avon, England: Multilingual Matters.
- McLaughlin, B. (1987), *Theories of Second-Language Learning*, Edward Arnold, London
- McLaughlin, B. (1990), ' "Conscious" vs. "unconscious" learning'. *TESOL Quarterly* 24, 617-34.
- McLaughlin, B. & Heredia, J.L.C. (1996), Information-processing approaches to research on second language acquisition and use. In Ritchie, W C. & Bhatia, T. K. (eds), *Handbook of second language acquisition*. San Diego: Academic Press, 213-28.
- Meara, P. (1980). 'Vocabulary Acquisition: A neglected aspect of language learning.' *Language Teaching and Linguistics: Abstracts* 13(4), 221-46.
- Mondria, J.A., & Wit-de Boer, M. (1991). "The effects of contextual richness on the guessability and the retention of words in a foreign language". *Applied Linguistics*, 12 (3), 249-267.
- Moon, Rosamund. 1998. *Fixed expressions and idioms in English: A corpus-based approach*. London: Clarendon Press.
- Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.
- Nation, I. S. P. (1990). *Teaching and learning vocabulary*. New York: Newbury House.

- Nation, I. S. P., & Coady, J. (1988). Vocabulary and reading. In R. Carter & M. McCarthy (Eds.), *Vocabulary and language teaching* (pp. 97-110). London: Longman.
- Nation, I.S.P. & Waring, R. (1997). Vocabulary Size, Text Coverage and Word Lists.
- Nagata, N. (1999). "The effectiveness of computer-assisted interactive glosses". *Foreign Language Annals*, 32 (4), 469-479.
- Nagle, S.J. & Sanders, S.L. (1986), 'Comprehension theory and second language pedagogy', *TESOL Quarterly*, 20 (1), 9-25.
- Nagy, W. E., Anderson, R. C., & Herman, P. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal*, 24, 237-270.
- Nagy, W.E., P. Herman, and R.C. Anderson. 1985. Learning words from context. *Reading Research Quarterly*, 20, 233-253.
- Nikolova, O. R. (2004). Effects of visible and invisible hyperlinks on vocabulary acquisition and reading comprehension for high – and average-foreign language achievers. *ALSIC*, 7, 29-54
- Norris, J., & Ortega L. (2000). Effectiveness of L2 instruction: A research synthesis and quantitative meta-analysis. *Language Learning*, 50, 417–528.
- O'Malley, J.M. & Chamot, A.U. (1990). *Learning Strategies in Second Language Acquisition*. Cambridge: Cambridge University Press.
- Oxford, R. & Scarcella, R. (1994). Second language vocabulary learning among adults: State of the art in vocabulary instruction. *System*, 22 (2), 231-43.
- Paivio, A. (1971). *Imagery and verbal processes*. New York: Holt, Rinehart, and Winston.
- Paivio, A. (1986). *Mental representation: A dual-coding approach*. New York: Oxford University Press.
- Paribakht, T. & Wesche, M. (1997). Vocabulary enhancement activities and reading for meaning in second language vocabulary acquisition. In J. Coady & T. Huckin (Eds.), *Second language vocabulary acquisition* (pp. 174-200). Cambridge: Cambridge University Press.

- Pitts, M., White, H., & Krashen, S. (1989). Acquiring second language vocabulary through reading: A replication of the Clockwork Orange study using second language acquirers. *Reading in a Foreign Language*, 5, 271-275.
- Plass & Jones. (2005) Multimedia learning in SLA. In Mayer, R (Ed.) The Cambridge handbook of multimedia learning. New York, NY: CUP (pp. 467-488.)
- Pulido, D. (2003). Modeling the role of second language proficiency and topic familiarity in second language incidental vocabulary acquisition through reading. *Language Learning*, 53, 233-284.
- Qian, D. D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *The Canadian Modern Language Review*, 56, 282-307.
- Read, J (2000). Assessing vocabulary. Cambridge: CUP
- Read, J. & Chapelle, C. (2001). A framework for second language vocabulary assessment. *Language Teaching*, 8, 1-32.
- Robinson, P. (1995). "Review article: Attention memory and the 'noticing' hypothesis". *Language Learning*, 45, (2), 283-331.
- Robinson, P. (1996). Learning simple and complex second language rules under implicit, incidental, rule-search, and instructed conditions. *Studies in Second Language Acquisition*, 18, 27-68
- Roby, W. B. (1999). "What's in a gloss?" *Language Learning and Technology*, vol. 2, 2, pp. 94-101.
- Rocheftort, C. (1961). Les petits enfants du siècle. Paris: France. Grasset.
- Rott, S., Williams, J. & Cameron, R. (2002). The effects of multiple-choice L1 glosses and input-output cycles on lexical acquisition and retention. *Language Teaching Research*, 6, 183-222.
- Rott, S. (2004). A Comparison of Output Interventions and Un-enhanced Reading Conditions on Vocabulary Acquisition and Text Comprehension. *The Canadian Modern Language Review* 61 (2), 169-202.
- Rott, S. (2005). Processing glosses: A qualitative exploration of how form-meaning connections are established and strengthened. *Reading in a Foreign Language*, 17(2), 95-124.
- Rott, S. (1999). The effect of exposure frequency on intermediate language learners'

- incidental vocabulary acquisition and retention through reading. *Studies in Second Language Acquisition*, 21, 589-619.
- Rovee-Collier, C., Hayne, H., & Colombo, M. (2001). *The development of implicit and explicit memory*. Philadelphia, PA: John Benjamins Publishing
- Rumelhart, D. E. (1980). Schemata: the building blocks of cognition. In *Theoretical issues in reading comprehension* (pp. 33-58), Ed by R. J. Spiro, B. C. Bruce, and W. F. Brewer. Erlbaum.
- Salomon, G. (1983). The differential investment of mental effort in learning from different sources, *Educational Psychologist*, 18(1), 42-50.
- Sank'ó, G. (2006). The Effects of Form- and Meaning-Focused Hypertextual Input Modification on L2 Vocabulary Acquisition and Retention. Ph.D. thesis, University of Debrecen, Hungary. URL <http://hdl.handle.net/2437/3763>.
- Sansome, R. (2000). Applying lexical research to the teaching of phrasal verbs. *IRAL*, 38, 59-69.
- Saragi, T., Nation, I.S.P., & Meister, G. F. (1978). Vocabulary learning and reading. *System* 6, 72-78.
- Schmitt, N. (2008). Instructed second language vocabulary Learning. *Language teaching Research*. 12 (3), 329-363. Retrieved from <http://ltr.sagepub.com/cgi/reprint/12/3/329>
- Schmidt, R. (1990). "The role of consciousness in second language learning". *Applied Linguistics*, 11, 129-158.
- Schmitt, N. (1997). Vocabulary learning strategies. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition, and pedagogy* (pp. 199-227). Cambridge: Cambridge University Press.
- Schmitt, N. & Schmitt, D. (1995). Vocabulary notebooks: Theoretical underpinnings and practical suggestions. *ELT Journal*, 49, 113-142.
- Scott, (1989). An empirical study of explicit and implicit teaching strategies in French. *The Modern Language Journal*, 73, 14-22.
- Smith, B. (2004). Computer-mediated negotiated interaction and lexical acquisition. *Studies in second language acquisition*, 26, 365-398.
- Stallings, J. (1980). Allocated Academic Learning Time Revisited, or Beyond Time on Task. *EDUCATIONAL RESEARCHER*. 9; 11-16.

- Stepp-greany, J. (2002). Student perceptions on language learning in a technological environment: Implications for the new millennium. *Language Learning and Technology*, 6, (1), 165- 180.
- Stoller, F. L., & Grabe, W. (1993). Implications for L2 vocabulary acquisition and instruction from L1 vocabulary research. In T. Huckin, M. Haynes, & J. Coady (Eds.), *Second language reading and vocabulary learning* (pp. 24-45). Norwood, NJ: Ablex Publishing.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12, 257-285.
- Sweller, J., (1999). *Instructional Design in Technical Areas*, Australian Council for Educational Research, Camberwell, Victoria, Australia: Australian Council for Educational Research.
- The American Heritage College Dictionary, 4th ed. (2002c). Boston: Houghton Mifflin Company.
- Tinkham, T. (1993). The effect of semantic clustering on the learning of second language vocabulary. *System*, 21: 371-380.
- Tinkham, Thomas. (1997). 'The effects of semantic and thematic clustering on the learning of second language vocabulary.' *Second Language Research* 13, 138–63.
- Tozcu, A.(1998). The Effect of Teaching Sight Vocabulary with Computer Assisted Instruction (CAI) on Vocabulary Gain, Decrease in Reaction Time for Frequent Word Recognition, and Reading Comprehension. Unpublished dissertation, University of Arizona.
- Watanabe, Y. (1997). "Input, Intake and Retention effects: Effects of incidental learning of foreign language Vocabulary". *Studies in Second Language Acquisition*, 19 (3), 287-307.
- Waring, Robert. (1997). 'The negative effects of learning words in semantic sets: a replication.' *System* 25, 261–74.
- Waring, R. and M. Takaki. 2003. At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language* 15, 2: 130-163.
- Warschauer, M., & Healey, D. (1998). "Computers and language learning: An overview." *Language Teaching*, 31, 57-71.

- Wesche, M., & Paribakht, T. S. (Eds.). (1999). *Incidental L2 vocabulary acquisition: Theory, current research, and instructional implications. Special issue: Studies in Second Language Acquisition*, 21, 175-335.
- White, J. (1998). Getting the learners' attention: A typographical input enhancement study. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 85-113). Cambridge: Cambridge University Press.
- Wittrock, C. (1990). Generative process of comprehension. *Education Psychologist*, 24(4), 345-376.
- Wode, H. (1999). Incidental vocabulary acquisition in the foreign language classroom. *Studies in Second Language Acquisition*, 21, 243-58.
- Yeh, Y. & Wang, C. (2003). Effects of Multimedia Vocabulary Annotations and Learning Styles on Vocabulary Learning. *CALICO Journal*, 21 (1) pp. 131-44.
- Yoshii, M. & Flaitz, J. (2002). "Second Language Incidental Vocabulary Retention: The Effect of Picture and Annotation Types". *CALICO Journal*, vol. 20, 1. pp. 33-58.
- Yoshi, M. (2006). L1 and L2 glosses: Their effects on incidental vocabulary learning. *Language Learning and Technology*, 10, 85-101.
- Zahar et al. (2001). Acquiring vocabulary through reading. *Canadian Modern Language Journal*, 57(4).
- Zimmerman, C., B. (1997). Do reading and interactive vocabulary instruction make a difference: An empirical study. *TESOL Quarterly*, 31 (1), 121-140.