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**Learning with *Laura*: Investigating the Effects of a Pedagogical Agent
on Spanish Lexical Acquisition**

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**Learning with *Laura*: Investigating the Effects of a Pedagogical Agent
on Spanish Lexical Acquisition**

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Dedication

To my wonderful parents, for all their sacrifices,
support, and unconditional love

Στους αγαπημένους μου γονείς, για όλες τις θυσίες,
τη συμπαράσταση, και την απέραντη αγάπη τους

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Learning with *Laura*: Investigating the Effects of a Pedagogical Agent on Spanish Lexical Acquisition

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The purpose of this study was to investigate the effects of an animated pedagogical agent on Spanish vocabulary learning. Furthermore, the study examined learners' reactions and attitudes towards the presence of the pedagogical agent in a web-based environment, as well as how learners used the conversational component of the pedagogical agent in their learning process.

A total of 47 university students enrolled in two fourth-semester Spanish classes participated in this study. Both the Control group and the Experimental group used a web-based environment that presented new vocabulary (in audio and text), along with activities for practicing the vocabulary in context. The difference between the two groups was that an animated pedagogical agent (*Laura*) was present in the environment used by the Experimental group. In addition, a conversational component was added at a second phase to the environment used by the Experimental group, which the learners used to chat with the pedagogical agent about the material presented.

The data were analyzed through quantitative and qualitative methods. The quantitative data were derived from a demographic information questionnaire, a vocabulary pre-test and two vocabulary post-tests (an immediate post-test and a delayed post-test), as well as from attitudes scales completed prior to the learners' exposure to the web-based environments and after completing the learning sessions. The qualitative data were derived from a learning experience questionnaire completed by all learners at the end of the learning sessions, as well as from the scripts of the chat sessions between the learners in the Experimental group and the pedagogical agent, and a chatting experience questionnaire completed by the same group.

Analysis of the quantitative data did not yield significant differences between the Control and the Experimental groups with respect to vocabulary learning outcomes and affective outcomes. Analysis of the qualitative data revealed learners' preferences with respect to features embedded in the web-based language learning environments. In addition, it explored how learners utilized the conversational aspect of the pedagogical agent, and provided information as to the type of information the agent's knowledge base should include in order for the agent to be a beneficial tool for the learners' progress.

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Chapter 1: Introduction

INTRODUCTION TO THE PROBLEM

In the past two decades, research in the field of Second Language Acquisition (SLA) has shed light on the importance and role of lexical acquisition as a substantial component in the SLA process (Schmitt, 2000). Even though traditionally more focus has been placed on grammatical knowledge, resulting in less attention to vocabulary acquisition (Zimmerman, 1997), recent trends in SLA research have acknowledged the importance of lexical acquisition.

In the last two decades, research in Computer-Assisted Language Learning (CALL) grounded in theories of SLA has also flourished. Several studies have explored the positive effects of computer-assisted learning and instruction on SLA and second/foreign language (L2) learning, including enhancement of: (1) reading skills (Leahy, 2001; Lee, 1997), (2) writing skills (Chun, 1994; Kern, 1995; Warschauer 1995/1996, 2000), (3) cultural knowledge and cross-cultural awareness (Abrams, 2002; Bernhardt & Kamil, 1998; Osuna, 2000), (4) the quality and quantity of language output by the learner (Beauvois, 1998; Kern, 1995), and (5) vocabulary knowledge (De La Fuente, 2003; Smidt & Hegelheimer, 2004; Smith, 2004). In comparison to other language skills, research in CALL and lexical acquisition is overall more limited, but has been more pronounced in recent years (Ma, 2007; Nakata, 2008, Ranalli, 2008). However, there are few studies that directly investigate the effects of CALL on lexical acquisition, as most of the studies focus principally on reading, and address vocabulary learning in a secondary set of results. For this reason, the purpose of the present study is to add to the body of research that specifically focuses on CALL and lexical acquisition.

As technology advances, so does the demand for applying technological tools in various fields of education. One of the latest products of the technological evolution is pedagogical agents. Pedagogical agents are human-like animated characters designed to operate in an educational setting to facilitate learning (Shaw, et al., 1999) through support of students' learning paths and provision of feedback. Lately, research in CALL has begun to explore this medium's communicative capabilities, primarily due to the increasingly rapid technological and social change in learning overall. Pedagogical agents present the potential to act as "key participants in the social interactions that mediate learning" (Dowling 2000, p. 43). They provide the learner with the possibility of additional forms of social interaction which can take place independently of the presence of another human being. As Johnson (1998) explains, pedagogical agents can support human learning by collaborating with the learner in the context of an interactive learning environment to which they adapt their behavior.

The effectiveness of pedagogical agents in an educational setting has been researched in various science, humanities, and education fields (Baylor, 1999; Baylor, 2000; Baylor & Ryu, 2003; Dowling, 2000; Johnson, 1998). However, minimal research has addressed the use of pedagogical agents in second/foreign language learning. Even though various benefits haven't been associated with the use of the agents, the possibility of these benefits being applicable to foreign language learning has yet to be extensively investigated. In an attempt to explore this possibility, the focus of this dissertation is to investigate the effects of a pedagogical agent on Spanish vocabulary learning.

NEED FOR THE STUDY

The expanding field of education has been revolutionized with "a tremendous growth...of interactive multimedia learning environments...especially computer-based

environments” (Rieber, 1996, p.43). In addition, various research studies have demonstrated the existence and effects of “the media equation”, which asserts that media equals real life; that is, people tend to confuse media and real life (Reeves & Nass, 1996). In their studies, Reeves and Nass (1996) revealed that “individuals’ interactions with computers, television, and new media are fundamentally social and natural, just like interactions in real life” (p. 5). This is especially true with today’s college students all over the world who are, for the most part, fully aware of the new technologies as they use them in their daily activities. Human-like systems render human-computer interaction to be much smoother. Most times, the users interact with software that is more closely associated with their personal experiences and develop an emotional connection with it.

Moreno, Mayer, Spires, and Lester (2001) support this thesis and argue that this sort of relationship between a learner and a pedagogical agent may facilitate learning. This argument becomes more important when considering the appealing interface of such agents which may provide a fun experience for the learner. Lester et al. (1997) maintain that “by creating the illusion of life, the captivating presence of the agents can motivate students to interact more frequently with agent-based educational software. This in turn has the potential to produce significant cumulative increase in the quality of a child’s education over periods of months and years” (p. 359).

Pedagogical agent technology has been used in a variety of content areas and with learners of different ages. For example, Baylor, Shen, and Warren (2004) used agents for the instruction of mathematics, Forbus and Kuehne (1998) used them in engineering thermodynamics and Lester et al. (1997) for teaching botanical anatomy and physiology. Some studies have shown that agent technology has the ability to motivate and engage learners. Pedagogical agents can bring a sense of personalization to learning because they are able to interact socially with the learner. They can therefore be a tool that promotes

active rather than passive learning and engage students in reflection. Allowing the learner to become an active participant in the learning process can aid in making associations with previous knowledge and engaging in meaningful learning (Mayer & Moreno, 2004).

Since the agent's personality and knowledge base is designed and implemented according to his/her creator, this tool can be particularly powerful in the hands of instructors. If, for example, an instructor finds that a concept is difficult for the students to comprehend, he/she can use an intelligent agent who is patient and supportive, and in addition provides scaffolds and encouragement to assist the learners. Baylor, Shen, and Warren (2004) for example, report on agents designed to support learners with math anxiety. Their results suggest that the motivational support provided by the agent positively impacts the beliefs of learners as to their ability to perform the learned task. Furthermore, since the use of pedagogical agents in education is still in its infancy (Craig, Gholson, & Driscoll, 2002), the introduction of such a tool in education may spark learners' enthusiasm and curiosity.

Although Papert (1993) and Romiszowski (1990) agree that a technological innovation could be a solution, the success of such innovation in education will be ultimately determined by the way it is viewed and utilized by instructors and learners: it might emerge as significant and ground-breaking or it might be just another tool that triggers temporary excitement due to its novelty. If pedagogical agents are contextualized into a course so as to become a supporting tool to the learning process, then they may have the potential to help learners both with respect to the content studied, and with respect to their motivation and attitudes towards the course.

As numerous second/foreign language textbooks are currently accompanied by supplementary material in a web-based environment or CD-ROM's that the learners purchase for practice and home study, the learners' experience could possibly be

enhanced by the presence of a pedagogical agent embedded in the CD-ROM or the web-based environment. If pedagogical agents have been proven to be effective as tutors or study companions/aids in other fields, it seems appropriate to investigate whether such effects could apply in language learning, and as a result enhance the learners' experience in the language learning process.

PURPOSE OF THE STUDY

Based on the established benefits of Computer-Assisted Language Learning (CALL) and Computer-Mediated Communication (CMC) in lexical acquisition, as well as the benefits of pedagogical agents in learning, I attempt to make a connection between these two fields of research and bridge them with SLA theories of lexical acquisition, by studying the effects of a pedagogical agent on Spanish vocabulary learning. I study such effects by comparing vocabulary learning in two web-based environments: one that incorporates an animated pedagogical agent and one that does not.

The purpose of the study is to investigate: (1) whether the use of an animated pedagogical agent in a web-based environment has any significant impact on Spanish vocabulary learning outcomes; (2) the effects of the pedagogical agent on learners' attitudes towards Spanish vocabulary learning; (3) learners' experiences when learning Spanish vocabulary in the two web-based environments; and (4) how learners use and react to an animated pedagogical agent when learning Spanish vocabulary.

SIGNIFICANCE OF THE STUDY

The findings from this study have both theoretical and pedagogical importance. On the theoretical side, this study adds a component to the existing literature on

pedagogical agents by studying the effects of such agent in language learning, and specifically in lexical acquisition, as well as to the existing literature in CALL and vocabulary instruction. Existing research on pedagogical agents is inconclusive as to the effects of pedagogical agents on learning outcomes and affective outcomes; therefore any additional investigation can provide further evidence to unveil the impact of this new tool and how it can be most efficiently and effectively used to enhance learning.

In addition to the theoretical importance, this study also has practical applications. If it is found that pedagogical agents do in fact motivate students and enhance their vocabulary learning and experience, then language educators and instructional designers should begin to explore the incorporation of pedagogical agents in web-based materials and educational software designed for foreign language learning.

CONCLUSION

Research has been conducted to examine the use and effects of pedagogical agents in education. However, there is minimal research with respect to the use of pedagogical agents in second/foreign language learning. The present study aims at addressing this issue.

This chapter has provided a general overview of the purpose of this study. Chapter Two offers an extensive review of literature relevant to lexical acquisition, CALL, and the social aspect of pedagogical agents. Chapter Three contains a detailed description of the methodology used in the study, including the research design, measures, data collection and analysis procedures. Chapter Four presents a detailed description of the results of this study. Finally Chapter Five presents an extensive discussion of the findings of this study, including the limitations of the study, as well as the contribution of the findings and possible recommendations for future research.

Chapter 2: Review of Literature

INTRODUCTION

This chapter presents a summary of the relevant literature as it relates to this study. I review research from three major areas of literature, in order to be able to draw information and make some connections, which have lead to the pursue and design of this study; these broad areas are: (1) Second Language Acquisition (SLA) theories on lexical acquisition, (2) research on lexical acquisition through Computer Assisted Language Learning (CALL), and (3) the education benefits provided by pedagogical agents. Each of these areas is discussed through various sub-topics, which are addressed individually within the three major sections of literature review that follow.

THE ROLE OF LEXICAL ACQUISITION IN SECOND LANGUAGE ACQUISITION

Introduction

In terms of lexical acquisition in SLA, there is comparatively limited research conducted. Traditionally more focus was placed on grammatical knowledge in research concerning topics in Second/Foreign Language Acquisition (SLA). However recent trends in SLA research have addressed the importance of lexical acquisition (Zimmerman, 1997). As Barcroft (2004) explains, the significance of the role that lexicon plays in SLA is underlined by the following points:

1. Vocabulary is needed in order to be able to communicate in a language, as absence of lexical knowledge impedes transmission of meaning during a conversation, resulting in a communication break-down. According to Gass & Selinker (2001) “the lexicon may be the most important language component for learners” (p. 372).

2. Research has shown that language learners attribute great importance to vocabulary knowledge (Arnaud & Savignon, 1997; James, 1996). Learners consider vocabulary knowledge to play a key role in their functioning in the target language.

3. Lexical knowledge plays a critical role in developing grammatical competence as well, as vocabulary aids in the storage of grammatical knowledge in the learner's mind; the way that individual words and strands of words are processed contributes to what a learner considers to be grammatical in the target language.

Having explored some of the reasons for which lexical acquisition is considered to be essential in second language (L2) learning, it is important to discuss research that addresses *how* vocabulary is learned. In the following sections, I present an historical overview of the main areas of research relating to the processes of lexical acquisition.

Incremental Vocabulary Learning

Learning lexical items in a second/foreign language (L2) is not something that can be accomplished by exposure to the specific lexicon just once. On the contrary, research has shown that lexical acquisition is a complex and incremental process (Hulstijn, 1992; Nation, 1990; Nation, 2001; Schmitt, 2000). Language learners need to have exposure to the lexical item, so as to notice its various components - morphological, phonological, semantic, stylistic aspects - and then store the item in their internal lexicon.

Establishing that a lexical item has been learnt and can be used appropriately in a variety of contexts involves different processes. The process of learning a lexical item is affected by factors, such as the specific item's orthography, morphology, length, and semantic properties (Ellis & Beaton, 1993; Nation, 1990; Nation, 2001; Schmitt, 2000; Schmitt & McCarthy, 1997). The process by which the lexical item is learnt is recursive and incremental and progresses through different levels, based on a progression in the

learner's familiarity with the item. In support of this view, Paribakht and Wesche (1993) developed the "Vocabulary Knowledge Scale", that indicates five stages in the process of lexical learning: (1) the lexical item is unfamiliar, (2) the item is familiar but its meaning is not known, (3) a translation of the item into the first language of the learner can be provided, (4) the item can be used appropriately in a sentence, (5) the item is used accurately both semantically and grammatically.

The two main processes of learning a lexical item – as discussed by research – are incidental (also referred to as "implicit") and intentional (also referred to as "explicit"). These two processes are discussed in the following section.

Incidental and Intentional Vocabulary Learning

The process of lexical acquisition has historically been described to occur by one of two main methods – incidental and intentional vocabulary learning (Barcroft, 2004; Gass, 1999). Recently, though, there has been much discussion in literature as to the defining mechanisms by which each process takes place, and as to the degree to which successful lexical acquisition involves a combination of the two methods.

Incidental vocabulary learning refers to the process by which language learners acquire new lexical items from context unintentionally, that is through exposure when a learner's attention is focused on the overall use of language, rather than the learning itself. Lexical items are acquired as a by-product of the learner being engaged in a different learning activity, which involves comprehension (Gass, 1999, p. 319); reading comprehension tasks are usually the most frequently cited ones. As Gass (1999) points out though, there has been much discussion in literature as to a specific definition for incidental vocabulary learning, since the cognitive processes in a learner's mind cannot

be examined in detail; therefore, there cannot exist a concrete rationale and explication behind incidental vocabulary learning.

On the other hand, intentional vocabulary learning refers to the process by which language learners acquire new lexical items through activities that have the intention of teaching vocabulary; that is, through the focused study of words. For example, studying lists of new words and completing activities in a workbook based on a set of target lexical items are considered to be intentional learning practices (Barcroft, 2004).

Studies have been conducted that support both methods of vocabulary learning. Some studies have shown that incidental vocabulary processing is indeed possible. Paribakht and Wesche (1997) found that students who read passages and answered reading comprehension questions gained vocabulary knowledge and demonstrated recognition of the lexical items, but not production. In their study, Gu and Johnson (1996) concluded that learners achieved vocabulary growth through extensive reading and through the use of various strategies. Ellis and He (1999) found that learners who used new lexical items in a communicative context retained words to a much greater extent than when the learners were only exposed to input. However, Prince's (1996) study focused on intentional vocabulary learning and indicated success in lexical acquisition. The author concluded that translation-based L2 vocabulary learning was more effective than L2 vocabulary learning based solely on the context of sentences.

In order to bridge the two extremes as presented by each of the two methods, Gass (1999) proposed a continuum between incidental and intentional vocabulary learning. She proposed that lexical items that tend to be learnt more incidentally are items: (1) that are recognized cognates between the learner's first language and the target language, (2) to which the learner has had substantial exposure, and (3) in a context where other related

L2 lexical items are known. She also proposed that lexical items possessing the opposite characteristics from the ones described above are better to learn more intentionally.

In recent years research has concluded that defining vocabulary learning as purely incidental or purely intentional is not a realistic view of lexical acquisition (Barcroft, 2004). There exists now a more unified view for both incidental and intentional vocabulary learning (Huckin & Coady, 1999; Smith, 2004). As Schmitt (2000) discusses, the consensus in research is that, for second language learners both incidental and intentional learning are necessary and should be seen as complementary.

Additional factors that play a role in successful lexical learning and retention have also been discussed in literature, such as the need for processing new lexical information more elaborately (Hulstijn, 2001), the need to involve the learner more with the lexicon through tasks (Laufer & Hulstijn, 2001), and the effect that individual differences and strategy use might have (Ellis & Beaton, 1993). One of the main areas of discussion with respect to lexical acquisition processes has been the use of Vocabulary Learning Strategies (VLS), which are presented in the following section.

Vocabulary Learning Strategies

As a result of research in the fields of Second Language Acquisition (SLA) and educational psychology on vocabulary learning, retention and production, there has been increased interest in how vocabulary should be taught in order to achieve successful learning and retention. A major strand of recent research has been the use of Vocabulary Learning Strategies (VLS) and their implications on learning and teaching.

The study of VLS focuses on how the actions of the learners themselves can affect their lexical acquisition. Commonly used VLS involve mechanical strategies (memorization, repetition, taking notes on vocabulary), rather than complex ones

(imagery, inferencing) (Nation, 2001; Schmitt, 2000). However research has indicated that complex strategies requiring active manipulation of the information, such as forming associations (Cohen & Aphek, 1981), and the Keyword Method (Atkinson, 1972) can enhance retention better than rote memorization and repetition. Both sets of strategies however are beneficial, as mechanical ones can be more suitable for beginning language learners, while complex strategies can benefit intermediate and advanced learners, due to the context accompanying more complex activities (Cohen & Aphek, 1981).

Schmitt (1997) presents a list containing 58 different VLS. The list is divided into two major classes: (1) strategies that are useful for the initial discovery of a word's meaning, and (2) strategies that are useful for remembering that word's meaning after being introduced. The strategies are further classified into five sub-categories: (1) Determination Strategies, (2) Social Strategies, (3) Memory Strategies (traditionally known as Mnemonics), (4) Cognitive Strategies, and (5) Metacognitive Strategies.

Strategies are rarely used in isolation; instead, multiple VLS are often used concurrently. It is important for teachers to raise awareness about the VLS and train learners to use them and recognize them in their learning process, because often learners are not guided appropriately as to how to benefit from the VLS. On the other hand, teacher training it also important for teachers to be able to help learners use strategies effectively, and provide them with appropriate feedback as to the use of the strategies.

Providing the learners with corrective feedback is a crucial part of the acquisition process, and there are different types by which this can be done. In the next section, I present some of the common techniques discussed in literature with respect to this area.

Corrective Feedback

Mackey (1999) explains that the idea of input has its roots in research by Hatch (1978) on the importance of input and interaction, and by Krashen (1985) on the fact that comprehensible input is vital to SLA. When referring to the role of input in SLA, there are many aspects related to input that can be discussed, such as error correction, types of input, the use of authentic material as input, input in relation to output, comprehensible input. In this section however, I am focusing on the role of corrective feedback as a form of input. Corrective feedback is the form of responses to learner utterances that contain an error (Ellis, Loewen, & Erlam, 2006). In literature two approaches are discussed in terms of corrective feedback – implicit feedback (no overt indicator than an error made e.g. recasts) and explicit feedback (direct/obvious indication of error made e.g. by telling the learner). Studies have supported both approaches.

In general recast studies have demonstrated that implicit feedback of this kind can have a beneficial effect on acquisition, especially when the recasts are more explicit in nature (as in Doughty & Varela, 1998). Other studies demonstrate that explicit feedback is of value. Carroll, Roberge, and Swain (1992) found that a group that received explicit corrective feedback directed at two complex French noun suffixes outperformed a group that received no feedback. Thus, the recast and explicit feedback studies demonstrate that both types of feedback can be effective.

However, there are overall more studies pointing to an advantage for explicit over implicit corrective feedback when production is involved. Carroll and Swain (1993) and Carroll (2001) reported that the group that received direct metalinguistic feedback outperformed all of the other groups in production of sentences. Muranoi (2000) found that the group that received formal debriefing outperformed the group that received

meaning-focused debriefing. Lyster (2004) reported that the group that received prompts performed better than the group that received recasts.

This of course does not mean that explicit feedback should be implemented in all error correction instances. The major argument of the studies above was that explicit feedback was more effective when production was the ultimate goal. Research on implicit feedback is considered to be valid and applicable, but it might be the case that it is more effective in certain instances, where production in the short-run is not the ultimate objective. Long, Inagaki, and Ortega (1998) found that that adult language learners who received implicit feedback in the form of recasts in conversation were able to learn more effectively with respect to conversation.

Lexical Teaching and Instructional Practices

Historical Overview of Practices

In the previous section, I presented an overview of how lexical learning has been historically approached in the literature, and I proceeded with an overview of the Vocabulary Learning Strategies (VLS) that have been proposed and discussed. Lexical learning however, cannot be discussed without making reference to lexical teaching, as these two areas in Second Language Acquisition (SLA) appear to be interrelated and affect each other proportionally. In a historical overview of language teaching approaches and methodologies, it can be observed that changes in lexical teaching approaches have had corresponding effects on lexical learning and have subsequently resulted in the formation of relevant learning strategies (Zimmerman, 1997).

Furthermore, it can be observed that language instruction has undergone a transition. The focus in language teaching methodology ranges from *language analysis*,

as proposed by the Grammar-Translation approach in the early 19th century to *language use*, as emphasized by the Communicative Language Teaching approach in the 1980's (Schmitt, 2000; Zimmerman, 1997). A recurring thread however in regards to the second language teaching approaches that emerged during this period, is that most of them did not clearly address how to handle vocabulary teaching and some methods relied on bilingual word lists, while others aspired that vocabulary would somehow be “absorbed naturally” during the learning process (Schmitt, 2000, p. 15).

During the 20th century, systematic work on vocabulary learning has given rise to concrete teaching and learning applications in regards to lexical acquisition, as well as patterning of vocabulary in discourse. The two major strands of lexical research that prevailed during this period and have triggered increased interest in this area of language learning recently are the Vocabulary Control Movement (Carter & McCarthy, 1988; Nation, 1983), and the advances in computer analysis techniques with the introduction of research in corpora (language databases). Consequently, new strands of vocabulary inquiry emerged looking at research from a psychological frame of reference as well, such as Ebbinghaus' work on testing for vocabulary learning by means of a paired-associates procedure (Ebbinghaus, cited in Woodworth & Schlosberg, 1955) relating back to Cattell & Bryant's (1889) work on how words are connected in the mind through the use of word associations.

As each major language teaching methodology made its way through the historical timeframe related to SLA approaches, so did the corresponding ideas on how vocabulary should be taught. Omaggio Hadley (2001) presents how vocabulary was taught in the “Three ‘Traditional’ Methods” (p. 106) before the 1970s. During the era of the Grammar-Translation Method, vocabulary was explicitly taught through bilingual vocabulary lists pertaining to the reading(s) of the lesson. Such lists were memorized in

order for the learners to be able to translate the activities that followed. The Direct Method prohibited the use of translation and long bilingual vocabulary lists and supported that definitions of lexical items should be given through paraphrasing in the second/foreign language (L2) or miming the action in order for the learner to understand the meaning. The Audiolingual Methodology on the other hand, presented a more naturalistic way of language learning, proposing that learners would eventually handle the L2 unconsciously and that vocabulary would somehow be “absorbed naturally” during the learning process (Schmitt, 2000, p. 15). Therefore vocabulary was presented implicitly and no specific practices were focused on its instruction.

As the Communicative Approach entered the domain of SLA in the 1980s, a rather naturalistic, top-down and more implicit approach remained in effect with respect to vocabulary teaching, emphasizing incidental teaching of the vocabulary (Sökmen, 1997). The Communicative Approach emphasized inferring word meaning from the context of a reading as the primary vocabulary skill. However various studies (Coady, 1993; Haynes, 1993; Hulstijn, 1993) have indicated that using solely an implicit teaching approach to vocabulary is an error-prone process and is ineffective as learners might use other techniques to guess the meaning of lexical items, without gaining comprehension of them. As a result, it has been proposed that implicit vocabulary instruction needs to be accompanied by a more bottom-up approach.

Looking at the trajectory of language teaching methodologies in the field of SLA, it is evident that vocabulary teaching has shifted from a completely explicit teaching approach under the Grammar-Translation Method to a completely implicit one under the Communicative Approach. Benefits and shortcomings have been discussed for both extremes. But, where does vocabulary teaching currently stand? What are the current approaches to vocabulary teaching? As Sökmen (1997) points out “The pendulum has

swung from direct teaching of vocabulary...to incidental...and now, laudably, back to the middle: implicit and explicit learning” (p. 239).

As noted above, current research in SLA suggests adding explicit vocabulary instruction to the usual contextualized inferring activities in the L2 classroom. It is important to maintain a communicative approach to vocabulary instruction, and to teach vocabulary in context, but explicit activities can also be incorporated in the communicative setting (Nation, 2001; Schmitt, 2000). In the following section, I present some of the instructional practices related to vocabulary teaching, as proposed by current research in the field.

Current Instructional Approaches

Schmitt (2000) proposes that “in any well-structured vocabulary program there needs to be the proper mix of explicit teaching and activities from which incidental learning can occur” (p. 145). There does not seem to be any disagreement as to how incidental learning can be achieved; on the contrary, there seems to be a general consensus that for this to be achieved learners must receive maximum exposure to the language and must be immersed in authentic contexts (Nation, 2001; Schmitt, 2000). Studying abroad seems to be the ideal option for optimal vocabulary learning as shown by the study of Milton and Meara (1995). However since this option cannot be widely available to all learners, the best alternative is increased reading opportunities and the majority of research has focused on incidental vocabulary learning through reading of authentic texts. Texts need to be selected of course to be appropriate for the learners’ proficiency level, but overall increased exposure to reading of authentic texts, such as newspaper articles and magazine excerpts, increases language learners’ vocabulary knowledge (Hulstijn, 1992; Hwang & Nation, 1989; Nation, 2001).

In order to avoid however the shortcomings discussed at the beginning of this section, which arise in terms of learning vocabulary through reading, explicit teaching activities need to be used. The challenge is to design successful communicative explicit teaching activities to be implemented in the context of incidental learning. Schmitt (2000) proposes the use of cloze tests in relation to the specific reading in question (p. 152). Omaggio Hadley (2001) suggests using semantic maps based on the content of the reading, through which learners can expand their vocabulary knowledge by exploring topics relevant to the main theme (p. 376).

Sökmen (1997) takes a broader approach and presents a number of more general key principles that teachers should keep in mind when designing explicit activities: (1) build a large sight vocabulary – so that students may automatically access word meaning and develop a large corpus of automatic word knowledge; (2) integrate new words with the old – so as to help students establish links between words and build associations; (3) provide a number of encounters with a word – through a variety of activities and in different contexts; (4) promote a deep level of processing – by asking students to manipulate words, to relate them to other words and their personal experience, and to justify their choices; (5) facilitate imaging and concreteness – by presenting vocabulary in an organized manner, such as presented in specific units, introduced in stages and summarized; (6) use a variety of techniques – by using a mixed approach in terms of vocabulary learning strategies in the classroom; and (7) encourage independent learning strategies – by presenting students with the possible strategies and then facilitating them while they independently choose what strategies are better for them.

As discussed in this section, vocabulary teaching has undergone major transformations, ranging from the extreme of only explicit instruction to the opposite extreme of only implicit instruction. However, current research supports a balanced

combination of the two approaches, in which learners achieve incidental learning in authentic contexts, and are also facilitated in their vocabulary comprehension and knowledge through embedded explicit vocabulary activities.

In order to be able to observe whether learners have in fact learned the set vocabulary through any instructional approach, it is important to provide the learners with some form of assessment. The following section presents an overview of various measures that have been used in literature relevant to lexical assessment.

Assessment of Lexical Learning

In order to assess lexical learning, various lexical tests have been published and have been used repeatedly in various research studies. There is no commonly accepted standardized test of English vocabulary, but the published lexical tests that exist have been successfully used in existing research. Each tool has its own focus, so it is important to determine what is being tested and for what reason it is being tested, in order to determine which tool is most appropriate to use in a specific study. The published lexical assessments tests that exist are:

1. The Vocabulary Levels Test, first devised by Nation (1990): it measures knowledge of words at four frequency levels – 2000, 3000, 5000, and 10000 – and it also has a special level for academic English words. The Vocabulary Levels Test consists of sets of words and definitions. In each set, the learner is required to choose from among six words those that match the three definitions provided. This test measures threshold meaning knowledge of the target words. It is a test used to assess knowledge of lexical meaning as well as understanding of how the target words can be used in context, based on their definition and the meaning they convey.

2. Checklist tests: in this type of test, words are presented on a list and learners are required to check if they know them or not. Meara (1989, 1996) is most closely related with this format, having developed pencil-and-paper checklist tests for EFL vocabulary learning. The checklist format permits a large number of vocabulary items to be tested and scored in a limited amount of time. Test words are drawn from a range of frequency levels, with performance at the respective levels used as the basis for inferring the size of the individual's receptive vocabulary (Meara, 1996). Meara (1990) has also created a computerized version of that format called "Eurocentres Vocabulary Size Test" (EVST). These tests focus on meaning and are good for placement tests.

3. The Vocabulary Knowledge Scale (VKS), by Paribakht and Wesche (1993), discussed in a previous section of the literature review: this is a test of depth of knowledge and it measures how vocabulary develops over time (developmental approach), by combining self-report with production.

4. Tests focusing on word associations: this type of tests measures which word-knowledge types are known (dimensions approach). One of the first examples of this type of tests was the Word Associates Test by Read (1993, 1995), which used association to measure associative and collocational word knowledge. Another version is the Association Vocabulary Test, by Vives Boix (1995), which focuses more on the degree of lexical organization.

5. The last group of tests refers to tests that are based on more embedded, comprehensive, context-dependent testing, such as analysis of the vocabulary produced in a written composition through statistical analysis, looking at lexical density, lexical variation, and lexical sophistication.

Each of these lexical assessment tests has its strengths and weaknesses, depending on the type of knowledge it assesses and the way that is implemented in a study. It is

therefore important to be aware of the features of each of these tests and use the most appropriate one, depending on the rationale for its use in the context of the study.

LEXICAL ACQUISITION THROUGH COMPUTER-ASSISTED LANGUAGE LEARNING

Overview of Existing Research and Literature

In comparison to research on the other language skills (reading, writing, listening, speaking, culture) through Computer-Assisted Language Learning (CALL), studies focusing on the effects of CALL on lexical acquisition are minimal. They do however indicate that CALL leads to positive effects, reinforcement, and successful achievement of lexical learning. A major concern expressed in many of these studies is the need for well-designed CALL tasks and activities, that help learners focus their attentional resources on certain lexical items in the target language (Chapelle, 2001), thus focusing their interactions on enhancing the learning of the specific lexical items.

In his study, Kern (1995) studied the effects of online communication on the learners' output, including lexicon. Through online discussion classes in which a synchronous conferencing tool was used to host exchanges of messages by students, he found that there was increased participation by the students and increased language output. Students' contribution in the discussion increased, as students became increasingly interested in the topics. They demonstrated increased written output, and their entries involved higher lexical complexity and more coherent thought as time progressed. Due to interaction in the computer-mediated environment, the learners' lexical output was more complex and more accurate in form.

Similar results were also observed by Beauvois (1998) and Toyoda (2000), concluding that computer-assisted environments lead to increased interaction, lexical

negotiation, and therefore improved quantity and quality of the learners' produced lexical outcome. In his study, Warschauer (1997) also pointed out that an Computer-Mediated Communication (CMC) allows language learners to interact, but also reflect on what is being said; therefore enhancing noticing, reflection and focus on the form of specific lexical items through modified output production.

In a similar setting to that of Kern (1995), Blake's (2000) study proved that incidental negotiations occurring in networked L2/L2 online chatroom discussions enhance second language acquisition and furthermore lexical confusions are resolved in the process. The results of Blake's study suggest that well-designed network tasks promote learners to notice gaps in lexical interlanguage and networked exchanges appear to be an example of forced output which is crucial in the promotion of second language acquisition. They also stimulate the learners' metatalk and reflections on their vocabulary use. Blake concluded that tasks in computer-mediated environments generate apperceived input, which can be used to modify and improve the learners' vocabulary and carefully-crafted tasks stimulate L2 learners to negotiate meaning, thus affecting the lexical output.

More recent studies have reinforced the conclusions drawn in the studies described above. Smidt & Hegelheimer (2004) studied the effects of online lectures on learners of English, focusing on their listening skills and lexical acquisition. They provided the learners with online video lectures, accompanied by an online dictionary, and then they asked the learners to take a multiple-choice comprehension test, a questionnaire, as well as a partial dictation test. It should be noted that learners took three partial dictation tests – pre-test, post-test, and delayed post-test. With respect to lexical acquisition, the authors concluded that the CALL activities enhanced vocabulary learning, and comparisons between the pre-test, and the post-test as well as the delayed post-test partial dictation tests indicated that incidental vocabulary learning occurred.

In their studies, De la Fuente (2003) and Smith (2004) focused on the role of interaction and negotiation of meaning (Long, 1996) with respect to lexical items presented to the language learners. De la Fuente used image mapping as well with the lexical items, followed by oral communication in order to complete information gap tasks based on the lexical items presented. Smith used jigsaw activities respectively as a means of oral communication based on the new lexical information presented. Both authors used pre-test and post-test vocabulary tests, geared towards the specific lexical items that the learners were exposed to. In both studies it was concluded that negotiation of meaning during interaction promoted acquisition and retention of L2 vocabulary forms. Smith (2004) points out that “learners can and do negotiate meaning when problems in communication arise in a CMC environment and that such routines are extremely successful at resolving these difficulties, especially as they relate to negotiation around lexical items” (p. 387).

Pedagogical Agent in CALL

As emphasized in many of the studies presented above, learners who complete their language learning through the use of CALL applications, have additional benefits that are attributed specifically to the fact that CALL leads to positive effects and successful achievements in the learning process. One of its major advantages is that it exposes the learner to authentic context as well as increased interaction and negotiation in the L2. Some of the CALL applications however, such as the use of the World Wide Web, the use of hypermedia, and the use of CD-ROM's, do not possess a strong ability in exposing the language learner to social interactions. It is for this reason that in recent years it has become common for some of these computer-based language environments to

include in their design some form of intelligent software agents, or some form of a pedagogical agent (Dowling 2000).

In recent years, research in CALL has focused more strongly on its communications capabilities, primarily due to the increasingly rapid technological and social change in learning overall. Pedagogical agents present the advantage of having the capacity to act as “key participants in the social interactions that mediate learning” (Dowling 2000, p. 43). They provide the learner with the possibility of having additional forms of social interaction, which can take place independently of the presence of another human. As Johnson (1998) explains, pedagogical agents can support human learning by interacting with the learner in the context of an interactive learning environment, to which they adapt their behavior.

Pedagogical agents play a social role in the interaction with the learner. This social role and the social interaction that takes place can take various forms. It can be justified however and supported through two theories of learning – the Social Cognitive Theory and the Socio-constructive Theory. In the following section, I discuss how these two theories of learning can be applied to explain the role, use, and effects of pedagogical agents in learning.

PEDAGOGICAL AGENTS AS SOCIAL AGENTS IN LEARNING

Introduction

How can teaching and learning be constructed in a computer-based environment so as to achieve successful learning? Such a question is often discussed in existing literature in cognitive terms, with a focus on how to promote cognitive processing in learners that will lead to appropriate cognitive representations. However, Vygotsky

(1978) argues that the teaching process is also an inherently social process involving communication between the teacher and the learner; communication between an agent of knowledge and the learner. The pedagogical agent thus takes the role of the agent of knowledge in the interaction with the learner. One example of this Vygotskian approach is the Cognitive Apprenticeship Theory (Collins, Brown, & Newman, 1989), which was developed from the observations of natural teaching in homes and communities.

With respect to the pedagogical agents and their social role in learning, two theories of learning need to be considered: the Social Cognitive Theory, based on Bandura's ideas, and the Socio-Constructive Theory, deriving its premises respectively from Vygotsky's ideas.

The Social Cognitive Theory

One of the most basic assumptions of the Social Cognitive Theory is the social role that learning has. This theory is based on the assumption that people learn by watching what others do, and that the presence of others affects the learner's behavior; people learn through "observational learning" and vicarious enactment of the observed behavior (Bandura, 2001). Learning is an internal process that may or may not change behavior, but what is important to note is that people behave in certain ways to reach their goal and that behavior is self-directed.

A central role in Bandura's ideas is dominated by the idea of mental models. What is proposed by this theory, is that the learner creates a mental model of the behavior that he/she observes, so that he/she can refer to this model when re-enacting the observed behavior; the learner thus becomes an agent in his/her learning (Bandura, 2001). For the development of the mental model to be accomplished and to successfully contribute to learning, the following factors need to be considered and accounted for:

(1) Attention: close attention to the key elements of behavioral learning must be paid; (2) Retention: by developing the mental model and then rehearsing it cognitively, performance and behavior is improved; (3) Production: learning is determined by the performance observed, which also indicates whether the modeling process was successful; (4) Motivation: direct reinforcement is needed so that the learner produces the mental model and enacts it, and so that there is continuation of the model.

Self-efficacy and self-regulation are crucial factors in Social Cognitive Theory; through high self-efficacy, the learner can believe and therefore engage in a particular behavior, thus increasing achievement. Self-efficacy is influenced by persistence, anticipation of reinforcement and success, resilience and attribution of failure to external factors, and finally willingness to accept feedback and change. Self-regulation involves intentionality on the part of the learner as to expectations and instructional goals, as well as forethought in terms of aiming at a desired outcome. Self-regulation plays an important role in learning, as the learner needs to set goals through model formation, and then perform self-observation, self-evaluation/critique and self-correction, as a means of assimilation to the model and desired objective.

The Socio-constructivist Theory

Constructivism holds that knowledge is not transmitted unchanged from teacher to student, but instead learning is considered to be an active process of recreating knowledge. It involves mind-full activity and meaningful interpretation on the part of the learner, who is expected to be mentally active with problems that he/she is presented and is asked to solve (Jonassen, 1999). Constructivist and Socio-constructivist perspectives share a strong similarity in terms of how the learner constructs meaning and interpretations of different events, by making sense of language and life. However the

Socio-constructivist perspective also includes the cultural, social and historical environment in which the learner exists and interacts (Schallert & Martin, 2003).

According to Vygotsky (1978), who was the main attributor of the Socio-constructivist Theory, the individual's development is a result of his/her culture. Development applies mainly to mental development, such as thought, language, and reasoning processes. These abilities are developed through social interactions with others and therefore represent the shared knowledge of the culture. These abilities are developed through a process called "internalization". This process describes how learners' social activities develop to become mental activities; for example when children listen and participate with parents, teachers, and peers, they begin to internalize and process new information.

Learning under this perspective occurs through interaction with any social artifact (people and objects), reflection, debate / conflict, and reorganization of the new information in the learner's mind (Palinscar, 1998). In addition, learning under the Socio-constructive Theory occurs through scaffolding of the knowledge received by a more knowledgeable other. Through scaffolding of the new information, learners are engaged in interactions that allow them to move to a level higher than their zone of proximal development, thus processing the new information and internalizing it.

The Social Role of Pedagogical Agents

According to literature on pedagogical agents, they have six typical roles. These roles, underlined below, follow the characteristics outlined by the two theories of learning presented above. In particular, the third and fourth roles listed below can be related to the Social Cognitive Theory, while the second, third, fourth, and fifth roles below relate closely to the Socio-constructivist Theory:

(1) *supplanting*: the instructional agents assume responsibility for the tasks and perform them for the learners. The learners observe the instructional agents while they perform the task (e.g., Salomon, 1994). This can be compared to what Clark (1990) called a "compensation" where (meta)cognitive activities are taken over for the learner;

(2) *scaffolding*: the instructional agents perform those parts of the task that learners are not yet able to perform themselves (Collins, Brown, & Newman, 1989; Jonassen, 1996). This might allow learners to perform on a level just above their current level, in their "zone of proximal development" (Vygotsky, in De Corte, Verschaffel, & Lowyck, 1994);

(3) *demonstrating*: the instructional agents show how a task is performed after which they observe how the learner performs the task (Merrill, 1994);

(4) *modeling*: the instructional agents show how a task is performed while revealing and explaining their reasoning process. The instructional agents solve a task while they articulate how problems are solved, what strategies are used, and what mental models are necessary to understand the task (Jonassen, 1996);

(5) *coaching*: the instructional agents provide hints and feedback, and activate the learner when the learner is performing the task. The instructional agents observe the learners when they are solving a task and provide guidance when students experience difficulties (Barab & Duffy, 2000), and

(6) *testing*: the instructional agents test the learners' knowledge about certain aspects of the task to guide the learning process (Martens & Dochy, 1997).

The interaction between the pedagogical agent and the student parallels Vygotsky's responsive social world in which more capable others play a role in the development of a child's thinking abilities (Vygotsky, 1978). According to this conception, adults often assist children in thinking about problems that they could not do

on their own but can do with assistance. The pedagogical agent can take a similar role to that of the more capable other in the interaction with the learner, but it can also take the additional role of the fellow learner, or the learning companion, with whom the learner can collaborate, discuss and even disagree (Chan, 1996).

When the learner sits in front of the computer to receive a multimedia lesson, the learner and the computer engage in a type of conversation, as the learner assumes that the computer is trying to explain something to the learner, and therefore the learner is trying to understand that; in this sense, the learner and the computer engage in social conversation (Moreno & Mayer, 2000; Reeves & Nass, 1996). Reeves and Nass (1996) propose that people interpret computers as social partners, a proposition which forms the basis for their “media equation”; because of a human tendency to confuse what is real with what is perceived to be real, people automatically use social rules to guide their actions with these media. As pointed out by Moreno and Mayer (2000), by following appropriate social cues in multimedia learning, the learner can hold a social conversation with the computer, simulating human-to-human interaction.

One theoretical framework that has emerged for considering the effectiveness and utility of fostering simulated human-to-human connections in multimedia learning environments is Social Agency Theory (Mayer, Sobko, & Mautone, 2003; Moreno, Mayer, Spire, & Lester, 2001). According to this theory, multimedia learning environments can be designed to encourage learners to operate under the assumption that their relationship with the computer is a social one, in which the conventions of human-to-human communication apply. This theory posits that the use of verbal and visual social cues in computer-based environments can foster the development of a partnership by encouraging the learners to consider their interaction with the computer to be similar to what they would expect from a human-to-human conversation. According to social

agency theory, priming the social interaction schema will cause the learner to try to understand and deeply process the computer's instructional message concerning academic subject matter. Perceiving the computer as a social partner encourages the learner to engage in a sense-making process that increases the probability of positive transfer.

Given how the pedagogical agent possesses a more human-like form with respect to physical appearance and gestures than the computer itself does, it can be expected that the learner will engage in a similar social conversation with the agent, following specific social cues, in order to sustain a simulated human-to-human interaction, as outlined by the social agency theory.

CONCLUSION

Many studies have been conducted in the past few years in order to evaluate the effects of pedagogical agents on learning and affective factors. Even though some studies have provided evidence to support that pedagogical agents can positively impact learning and attitudes, other studies have not found such significant results. What's more, there is minimal research with respect to pedagogical agents and second/foreign language learning, and the majority of it focuses on English language learning. The present study was designed to address this issue, by investigating the effects of a pedagogical agent on learning and affective outcomes related to Spanish vocabulary learning. The methodology used to conduct the study is described in the following chapter.

Chapter 3: Methodology

INTRODUCTION

This chapter first presents the research questions of this study and then describes the research design, which was used to address these questions. A discussion of the instruments used follows, and finally the data collection procedures and how the data were analyzed are presented.

RESEARCH QUESTIONS

The following research questions were addressed in this study:

1. Does the presence of a pedagogical agent have an effect on vocabulary recall and retention?
2. What are learners' attitudes and reactions towards Spanish vocabulary learning in the two web-based environments?
3. What are learners' experiences when learning Spanish vocabulary in the two web-based environments?
4. How do learners use a pedagogical agent when learning Spanish vocabulary?

Hypotheses

The main hypotheses were primarily based on the social nature and role that pedagogical agents play in learning (Mayer, Sobko, & Mautone, 2003; Moreno, Mayer, Spires, & Lester, 2001). They were related to the issues investigated by the first and second research questions, mainly learning and affective outcomes. It was hypothesized that there would be a significant difference in lexical recall and retention between the two groups (Control and Experimental), with learners in the Experimental group

demonstrating higher scores in recall and retention in comparison to those of the learners in the Control group. It was also hypothesized that learners in the Experimental group (using the web-based environment in which the agent was incorporated) would exhibit more positive attitudes towards Spanish vocabulary learning than the learners in the Control group (using the web-based environment without the pedagogical agent).

RESEARCH DESIGN

Setting

The study took place during the Spring semester of the 2008 academic year at The University of Texas at Austin, where I taught Spanish as a Graduate Instructor in the Department of Spanish and Portuguese. This Department has a very large undergraduate program. The majority of undergraduate students at The University of Texas at Austin are required to complete a two-year foreign language requirement, and Spanish is the language that most of the students select. Given the large student population, each of the four levels (Spanish I, Spanish II, Spanish III and Spanish IV) has its own supervisor, whose main task is to provide uniformity among the 25-35 sections and instructors (per semester) of the specific course. The students enrolled in the first three semesters of Spanish courses are required to buy the textbook Impresiones (Salaberry, Barrette, Elliott, & Fernández-García, 2004), as well as the supplementary material accompanying the textbook (a student activities manual, an interactive CD-ROM with grammar activities, and a video CD-ROM). These students are also required to attend the language laboratory once a week, where they complete different activities related to the content of the textbook. The students enrolled in the fourth-semester Spanish course are required to buy the textbook Punto y Aparte (Foerster & Lambright, 2007). If they want, they can buy an

optional interactive CD-ROM as supplementary material to the textbook, which they can use to practice vocabulary and grammar. The textbook has an online student center, a website with vocabulary and grammar exercises for each chapter of the textbook, which the students are encouraged to use throughout the semester for further practice of the material presented in the textbook.

Participants

The participants of this study were 47 students enrolled in two fourth-semester Spanish classes; this is considered to be the last semester in the two-year foreign language requirement at The University of Texas at Austin and students in this course are considered to be at the intermediate to intermediate-high level. The participants consisted of two intact groups; 24 participants belonged to the Control group and 23 participants belonged to the Experimental group.

The Control group used a hypertext web-based environment designed to teach Spanish vocabulary on the topic of “La situación del mundo” (*The state/situation of the world*). The Experimental group used the same web-based environment to learn Spanish vocabulary, with the addition of an animated pedagogical agent (Laura) embedded in the environment. An extensive description of the web-based environments and the pedagogical agent is presented in the following sections.

Web-based environments

As described in the previous section, the participants formed two intact groups. Each of these groups used a specific web-based environment, created by me, in order to learn new vocabulary on the topic of “La situación del mundo” (*The state/situation of the*

world). These web-based environments had the same format in terms of the content presented and the types of activities, with the exception of the animated pedagogical agent (Laura), which was incorporated only in the environment of the Experimental group. Despite this difference in the two environments, time-on-task spent by the learners was the same for both groups. The two web-based environments were piloted before their implementation with the participants in this study, so as to assure that their appearance and content were clear and appropriate for learners at this language level. Below, the two web-based environments are presented and the differences between them are addressed.

As mentioned in a previous section, the textbook that the participants used in the Spanish fourth-semester course had a supplementary website/online student center, which included additional resources for the students, such as vocabulary exercises, grammar exercises, and cultural information. As a means of validity, the web-based environments created for the present study resembled many of the features of the textbook website, such as the presentation of the lexical items both in text and audio (an audio clip for each item), and the format of the activities used to practice the vocabulary (true/false, multiple choice, short-answer questions). This way, students would already be familiar with the format of the web-based environments, thus avoiding the possibility of that affecting the results. In addition, the presentation of the vocabulary on the web-based environments would not interfere with the way in which new vocabulary presentation was approached in the specific course, as vocabulary presentation was executed through definitions and examples, a format which also appeared on the web-based environments.


The environments presented vocabulary according to an incremental and intentional method of learning (Gass, 1999). The learners were exposed repeatedly to each lexical item, and they were also exposed to different forms of each lexical item. The participants were able to select the lexical item they wished to learn, and a different


window opened with information relevant to the specific lexical item. Each item had its own window, on which the following appeared: First, there was an audio clip for the pronunciation of the item, then there was translation of the word to English, then a definition was provided for the item (both in text and audio), and fourth there was an example sentence using the item in context (both in text and audio). The audio on the windows for the lexical items was derived from the voice of the pedagogical agent. The participants then completed activities that focused on the use of the lexical items. Each item was purposefully used repeatedly throughout the web-based environment and learning progressed in an incremental way, moving gradually towards more contextualized use of the lexical items.

When opening the website of the web-based environment, the learners saw three text boxes in front of a pale yellow background. The first text box was burgundy and presented in pale yellow letters the title of the environment, “La situación del mundo”. The second text box was a brighter yellow with a burgundy border included a black heading of “Parte I: ¡A Aprender!” (*Part I: Let’s Learn!*) and two lists of ten lexical items each. Each Spanish lexical item was a hyperlink next to which was the translation of the item in English. When clicking on the hyperlink of a lexical item, a small window, of pale yellow background, popped up. On the window, as a title appeared the specific lexical item in burgundy letters, and below it appeared three lines of text each accompanied by a “play” button to the left, which indicated the presence of an audio clip. The first line provided the text and audio of the item, the second line provided the text and audio of its definition, and the third line provided the text and audio of an example sentence in which the item was used in context. After going through the information on the window, the learners closed it and moved on to another lexical item accompanied by

a similar window. An example of the window that opened for each lexical item is presented in Illustration 1, in this case for the word “la sequía” (*drought*).

la sequía

la sequía - *drought* 

Definición: lo que les pasa a la tierra y al medio ambiente cuando no llueve por mucho tiempo 


Ejemplo: El año pasado la economía de Colombia sufrió mucho a causa de la sequía que resultó porque no llovió por nueve meses en muchas regiones del país. 

Illustration 1: Window of lexical item in Control group’s environment

After studying the information provided for all the lexical items, the learners moved to the third text box on the web-based environment’s main site. The olive-colored text box with the pale yellow heading of “Parte II: ¡A Practicar!” (*Part II: Let’s Practice!*) provided the learners with instructions as to the activities they needed to complete in order to practice the lexical items presented, and a hyperlink indicated where the learners should click in order to be directed to the activities.

The activities were intentional and focused on the use of each lexical item in context. The first one implemented a true-false format to statements in which the vocabulary was used in context. The learners read a series of sentences which incorporated the vocabulary in the context of the general theme of the environment, and for each one the learners responded by clicking on either the “Cierto” (*True*) or “Falso”

(*False*) button. A text box was also provided in which the learners were asked to write a corrected version of the statement in the case their answer was “Falso”. The second activity implemented a multiple choice format in order to complete sentences with the appropriate vocabulary word. The sentences used the vocabulary in the context of the broader theme and for each sentence a choice of three words was provided, of which one was the correct. After completing each of these two activities, the learners received immediate explicit feedback as to the correct answers to the activities. Finally, the learners were asked to complete a productive task, in which they had to incorporate several of the lexical items learnt. They were asked to answer short-answer questions which focused on the general topic of “La situación del mundo” and prompted learners to incorporate the new vocabulary presented in the environments. Illustrations of the web-based environment as well as these practice activities can be found in Appendix A.

All the environment features described above were identical for both web-based environments. The Experimental group however, used a web-based environment in which an animated pedagogical agent, Laura, was present. The agent appeared on the upper right corner of the website of the environment, next to the first text box (with the title “La situación del mundo”). Upon opening the site of the web-based environment, Laura greeted the learners and gave them instruction as to how they should proceed by saying: “Hola y bienvenido a esta página web. Yo soy Laura y estoy aquí para ayudarte con el vocabulario que aprenderás. En esta página web aprenderás y practicarás nuevo vocabulario sobre temas relacionados con la situación del mundo en el pasado, en el presente, y en el futuro. Primero, tienes que completar Parte uno. Tienes que hacer clic en cada una de las palabras para ver más información sobre ellas. Luego, tienes que completar Parte dos. Tienes que completar algunas actividades para practicar el nuevo vocabulario. Bueno, buena suerte y si me necesitas, estoy aquí para ayudarte.” (*Hello and*

welcome to this website. I am Laura and I'm here to help you with the vocabulary that you will learn. In this website you will learn and practice new vocabulary about topics related to the situation of the world in the past, present and future. First, you have to complete Part one. You have to click on each of the words in order to see more information about them. Then, you have to complete Part two. You have to complete some activities in order to practice the new vocabulary. Well, good luck and if you need me, I am here to help you.) Illustrations of this web-based environment can be found in Appendix A.

Laura also appeared on each of the windows that opened when clicking on each of the lexical items. The content and design of the window was the same as the one described above, however Laura was also present and every time a “play” button was pressed, she delivered the content of the audio. The voice of the agent provided all the audio (for both environments), but she was also present on the web-based environment used by the Experimental group. An example of the window that opened for each lexical item in the environment used by the Experimental group is presented in Illustration 2, in this case for the word “la sequía” (*drought*).

la sequía

la sequía - *drought* ▶

Definición: lo que les pasa a la tierra y al medio ambiente cuando no llueve por mucho tiempo ▶

Ejemplo: El año pasado la economía de Colombia sufrió mucho a causa de la sequía que resultó porque no llovió por nueve meses en muchas regiones del país. ▶




Illustration 2: Window of lexical item in Experimental group's environment

An additional component that was added to the web-based environment of the Experimental group at a later stage was a conversational component with the agent. This feature became available to the learners of the Experimental group *after* all training sessions and post-tests (immediate and delayed) were completed for both groups. The addition of the conversational feature was to facilitate data collection for the exploratory component of this study. The purpose of this component was to explore how the learners used the pedagogical agent as part of their Spanish vocabulary learning and to observe some of the issues that arose. The type of interactions learners had with the pedagogical agent and the type of questions they asked her were the basis for exploring how learners use such a tool when implemented for learning new vocabulary in Spanish and what type of information they seek to elicit from the pedagogical agent.

The chat component appeared as a fourth text box on the main website of the environment with the heading of “Parte III: A ¡Conversar!” (*Part III: Let's*

converse/talk!). The learners in the Experimental group were asked to chat with the agent in Spanish about the lexical items presented in the web-based environment, but purposefully no restrictions or further specifications were provided so that learners would feel free to ask her any type of relevant questions they wished. The learners typed their questions or comments in the chat box provided and they could hear Laura's response while also reading it in the same chat box. The conversational component with the pedagogical agent is presented in Illustration 3. The structure of this component as well as the design of the pedagogical agent is described in more detail in the following section.



Illustration 3: Conversational component with the pedagogical agent

Pedagogical agent

As described in the previous section, an animated pedagogical agent was incorporated in the web-based environment used by the Experimental group that greeted the learners once they entered the environment, presented the material related to the vocabulary items and lastly chatted with the learners. The agent, named “Laura” was created by me. Two major components were involved in the design of Laura: the image and animation of the agent, and the knowledge base behind it.

Obtaining an agent required purchasing an account with “Oddcast” (<http://www.oddcast.com>), which included ten agents. Each agent could be modified and customized. In order to create Laura, a default female agent was chosen. Through the agent settings, I then customized the hair (cut and color), skin tone, face shape, eyes (shape and color), eyebrows (shape and color), lips (shape and color), body figure (height and width), clothing, and accessories of the agent. It was my intention to avoid any extreme or distracting features related to the agent, so as to not interfere with the learners’ concentration during their learning sessions with Laura.

An additional feature provided for the agent was the audio. The audio input in the agent was provided through the text-to-speech feature, which allowed for the creation of audio files of the written utterances provided. I input all the information in the online text-to-speech program, which in turn created the audio files. The program in which the pedagogical agent was created allowed for lip synchronization between the animated agent and the audio clips. Additional animated features of the agent included eye and head movement. Laura, the pedagogical agent, is presented in Illustration 4.



Illustration 4: Laura, the animated pedagogical agent

The Spanish knowledge base was added to the agent after being created through a separate site. An account was created with “Pandorabots” (<http://www.pandorabots.com>), a free software bot hosting service. This account was used in order to create the knowledge base of the agent by using Artificial Intelligence Markup Language (AIML). I trained myself in this language through various online resources and then created my own Spanish knowledge base, which even though limited, primarily focused on the vocabulary content of the web-based environments. The knowledge added to the agent allowed for the utterances that she produced during the chat sessions with the learners. Every utterance appeared in text in the chat box and was also spoken by Laura.

Through the agent settings there were a couple of options with respect to the Spanish accent that the agent could have. The accent chosen for Laura was a standard Mexican Spanish accent. As explained by Santa Ana and Parodi (1998) “Standard

Mexican Spanish, like any standard variety, is the form of speech of educated speakers. It is taught in schools and is used in written texts throughout Mexico. The Mexican standard is a variety of Modern Spanish; i.e. it has certain features that are accepted by educated Spanish speakers throughout the Hispanic world.” (p. 37). The specific accent was chosen so as to resemble the accent used by the instructor of the two groups of participants.

With respect to the exploratory component of this study, the learners were asked to chat with Laura in Spanish in order to help them improve their knowledge of the newly-learned words. As explained above, I created the Spanish knowledge base for the pedagogical agent using Artificial Intelligence Markup Language (AIML). The knowledge was a work-in-progress and it was therefore expected that there would be questions which I might have not anticipated, and to which the agent would not be able to respond. This would not interfere with the scope of the exploratory component of the study, because the main objective of this component was to explore what types of information learners want to elicit from a pedagogical agent when used in a similar context.

Lexical items

The specific topic for the content of the web-based environments, “La situación del mundo”, was chosen because it was in line with a substantial component of the course in which the participants were enrolled, which dealt with current sociocultural issues in the Spanish-speaking world. The specific lexical items presented in the environments varied in type, so as to include cognates, high frequency words, words of different lexical difficulty and words of different morphological and semantic properties. In total, 50 lexical items were presented to the learners, in three separate sessions. During the first

session, which was an orientation to the environments, the material and the post-test, aimed at increasing learners' familiarity with the content, 10 of the 50 words were presented to the learners. During the following two sessions, 20 words were presented at each time. The ten words presented on the day of orientation were not included in the post-tests completed by the learners. The procedures are described in detail in the "Data collection procedures" section below.

The pre-test administered aimed at identifying items which the learners could recognize and those were not included in the environments. The immediate post-test assessed recall of the vocabulary items, while the delayed post-test assessed retention. These measurement tools were some of the tools used to collect data for the quantitative component of the study. These tools and the theoretical background of their design are presented in the following section.

Instrumentation

A. Quantitative Data

1. Background/Demographic Information

All the participants were asked to complete an online questionnaire (found in Appendix B), which aimed at gathering background and demographic information about: (1) the learner's gender; (2) the learner's age; (3) the learner's major; (4) the learner's GPA; (5) the learner's reasons for taking the course; (6) the learner's skill of using technology; (7) whether the learner had used a pedagogical agent or virtual character in the past; (8) the amount of prior exposure, if any, the learner had to specific types of technology (website, search engine, online tutor, online help tools, online discussion list, online course, online language course, online language learning activities, online game).

These specific categories were included in the questionnaire, in order to collect information, which could provide further analysis of the data and results in the future, such as any relationship between gender and the use of the web-based environments, or any relationship between academic achievement and lexical gain scores through the use of the agent, or any relationship between prior exposure to technology and attitudes towards learning with a pedagogical agent.

2. Pre-test

The pre-test (found in Appendix C) was administered two weeks before the first learning session took place. The format of this pre-test was based on the “Checklist Test” or “Yes/No Test” proposed by Meara (1989). The “Checklist Test” measures receptive L2 vocabulary knowledge by eliciting a simple judgment as to whether a presented item is known or not. The learners were therefore asked to check those words that they could recognize and were familiar to them to any extent. In order to account for the learners’ veracity, they were also asked to provide the English translation for each of the lexical items that they marked as being familiar to them. Any words that even one learner could recognize were not included on the web-based environments. The 50 words that were used for the orientation and learning sessions were words that *no* learners had recognized on the pre-test.

3. Immediate Post-test and Delayed Post-test

An immediate post-test was used at the end of each learning session in order to assess recall of the lexical items presented on the environment during the specific session. The same test was used as a delayed post-test to assess retention fifteen days after the learning sessions. The format of these post-tests was based on the “Vocabulary Levels Test”, created originally by Nation (1990), and improved later by Schmitt, Schmitt and Clapham (2001). The Vocabulary Levels Test consists of sets of words and definitions. In

each set, the learner is required to choose from among six words those that match the three definitions provided. The immediate and delayed post-tests can be found in Appendix D.

The tests discussed in this section are presented in the following table as a summary of the measurement tools used to collect data in order to address the first research question of the study.

Tool	Description	Purpose
Pre-test	“Checklist test” (Meara, 1989)	Check for lexical recognition
Post-test; immediate	“Vocabulary Levels Test” (Nation, 1990; Schmitt, Schmitt and Clapham, 2001)	Measure lexical recall
Post-test; delayed	“Vocabulary Levels Test” (Nation, 1990; Schmitt, Schmitt and Clapham, 2001)	Measure lexical retention

Table 1: Summary of vocabulary learning tests

4. Attitudes scale

In addition to the three tests presented above, an attitudes scale was also used to collect quantitative data. As presented in the Review of Literature chapter, studies have shown that pedagogical agents increase students’ motivation, engagement and attitudes towards the learning process and the content they learn. In order to address the second research question, an attitudes scale was administered before the learners were introduced to the environments (pre-scale) and another attitudes scale was administered after the learning sessions were completed (post-scale). The design of these attitudes scales was based on attitudes/motivation scales used in research studies by Kim (2004) and Moreno,

Mayer, Spires, & Lester (2001) that investigated the effect of pedagogical agents on affective outcomes.

The scales aimed at investigating differences between the two groups with respect to attitudes and reactions towards the use of the web-based environments, vocabulary learning, and the pedagogical agent (in the case of the Experimental group). The pre-scale consisted of four questions, each one focusing on the participants': (1) interest in learning new vocabulary in Spanish , (2) enjoyment in learning new vocabulary in Spanish, (3) motivation to learn new vocabulary in Spanish, and (4) confidence in using new vocabulary in Spanish. The post-scale consisted of nine questions, focusing on the same four types of attitudes depicted on the pre-scale but elaborated through different questions. Both scales were rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The attitudes scales provided to the two groups can be found in Appendix E.

B. Qualitative Data

1. Learning experience questionnaire

At the end of the learning sessions, the participants were asked to complete an online open-ended questionnaire focusing on their learning experience in the web-environments. Data from this questionnaire were used to address the third research question, as learners were asked questions concerning their experience using the web-based environment, and their experience learning vocabulary through the web-based environment and in the case of the Experimental group, the pedagogical agent. The questionnaire for the Control group was comprised of six questions focusing on: what the participants liked and disliked about the environments; what aspects they found to be the most and least engaging; what aspects they found to be the most and least helpful; whether they considered the environment to be effective in their learning process;

whether they would be willing to use it on a regular basis as part of the language course; and any additional comments they had. The questionnaire for the Experimental group was comprised of the same six questions with the addition of one question regarding their reactions to the presence of the pedagogical agent in the environment and her effects on their learning process. The questionnaire, that each of the two groups completed, can be found in Appendix F.

2. Chat scripts

The learners in the Experimental group chatted with the animated pedagogical at a secondary phase of the study which aimed at exploring how learners use a pedagogical agent to learn Spanish vocabulary. They were asked to chat with her in Spanish and elicit from her further information in order to help them learn, contextualize, and practice the new vocabulary. All the scripts from these chats were saved and the data from what the students typed helped address the fourth research question.

3. Chatting experience questionnaire

After completing the chat with the pedagogical agent, the learners were asked to provide their opinion and discuss their experience chatting with Laura through a very short online questionnaire consisting of the following open-ended questions: (a) What were your reactions/feelings towards chatting with Laura and why?; (b) What additional questions would you like to have asked Laura, but did not do so during your chat session(s)? Why would you have asked these questions?; and (c) Please add below any other comments (positive or negative) you might have that will help in improving this learning tool. Responses from this questionnaire also helped to address the fourth research question.

DATA COLLECTION PROCEDURES

Permission to conduct this study during the Spring 2008 semester was from the Director of the Language Program at the Department of Spanish and Portuguese at The University of Texas at Austin, and the necessary IRB approval was received from the Human Subjects and Institutional Review Board (IRB) at The University of Texas at Austin prior to the commencement of the study. A consent form (found in Appendix G) describing the purpose of this study was given to each student. The form explained that participation was voluntary and that all answers would remain confidential and anonymous. In addition, students were informed that the study would in no way affect their grade or status in the course. My contact information (name, phone number, email address) was also included on the form, in case the participants had any questions or comments regarding the study.

Two weeks prior to the training session (the orientation session), the learners completed the online demographic information questionnaire, the pre-test (vocabulary test) and the pre-scale (attitudes scale). For all three sessions (orientation and two learning sessions), the learners met in the language laboratory. I was present at all sessions, in order to present the environments and also to provide any assistance that the students needed when using the environments.

The orientation session was given one week prior to the two learning sessions. The two learning sessions were completed in the same week (one day apart), since approximately one week was the usual timeframe for completing one instructional unit / chapter in the textbook for the specific course. All sessions lasted 50 minutes (40 minutes for using the environments and 10 minutes for the post-test).

During the orientation session, the participants were presented to the web-based environments, received detailed information about the features of the environments, the

activities, and the order that should be followed when learning the vocabulary. They then practiced using ten lexical items that were presented in the environments. They were also asked to complete a post-test on those lexical items, so that they would be familiar with the format of the post-test. These ten lexical items were only used for practice and the data from the post-test were not included in the data analysis.

During the first learning session, 20 lexical items were presented to the learners on the web-based environments. The learners were given 40 minutes to work on the environment, study the vocabulary and complete the activities. Immediately after, the participants completed the post-test, which included all 20 lexical items. The same procedures were followed during the second learning session with 20 different lexical items and an accompanying post-test. At the end of this session, the learners were also asked to complete the attitudes post-scale. The learning experience questionnaire also became available to the learners and they were instructed to complete it online. The delayed post-test was administered 15 days after the second learning session was completed and included all 40 lexical items.

A couple of days after completing the delayed post-test, the conversational component with the pedagogical agent became available to the Experimental group, who was provided with brief information as to how this component should be used. The conversational component was made available to the learners for one week, at the end of which they were asked to complete online the chatting experience questionnaire.

DATA ANALYSIS

Data analysis for this study involved both quantitative and qualitative procedures. The data were analyzed in the following ways:

Quantitative Data

Data were first coded by assigning a code name to each participant. For the Control group, the acronym “SC” (Student Control) was used and a number followed (ranging from 1 to 24). For the Experimental group, the acronym “SE” (Student Experimental) was used and a number followed (ranging from 1 to 23). The Statistical Package for Social Sciences (SPSS), version 16, was used for the quantitative data analysis. Descriptive statistics were used to summarize the results obtained from the background/demographic information questionnaire. The descriptive statistics consisted of means, standard deviations, percentages, and maximums and minimums.

The quantitative data collected from the pre-test, as well as the two immediate post-tests and the delayed post-test were analyzed by using a two-way repeated-measures Analysis of Variance (ANOVA). This specific measure was chosen, in order to account for the differences between the two groups of participants (Control and Experimental) with respect to the effects of time on their recall and retention of each of the two different sets of vocabulary items.

The data collected from the attitudes scale completed prior to the participants’ exposure to the web-based environments (pre-scale) and the attitudes scale completed after the two learning sessions (post-scale) were analyzed by using a Multiple Analysis of Covariance (MANCOVA). This specific measure was chosen in order to determine whether there were any differences in the two groups (Control and Experimental) with respect to the participants’ attitudes towards Spanish vocabulary learning.

Qualitative Data

The data collected from the learning experience questionnaires were analyzed in depth, based on the model of the constant comparative method (Glaser & Strauss, 1967). The data from the two groups were read and analyzed individually and then the data across groups were analyzed in order to identify emerging common themes with respect to the learners' perceptions and experiences in using the web-based environments to learn vocabulary. Emerging patterns were compiled and reanalyzed in order to confirm and contest the themes across the groups.

In order to analyze the data for the exploratory component of this study, both the data collected from the chat scripts as well as the data collected from the short chatting experience questionnaire, were analyzed through content analysis (as described in Gall, Gall, & Borg, 2003). I investigated the types of questions or comments that students typed during their interaction/chatting time with the agent. This allowed me to look for themes that emerged from the data and thus explore how the learners used the pedagogical agent. The data from the short questionnaire were analyzed in an attempt to explore and identify themes that characterized learners' behavior, attitudes, opinion, and approach towards the pedagogical agent in their learning process.

The following table summarizes the data collection and analysis methods for each of the research questions, as well as related hypotheses.

Research Question	Data Collected	Data Analysis	Hypothesis
1. Does the presence of a pedagogical agent have an effect on vocabulary recall and retention?	- Pre-test - Post-test (Immediate and Delayed)	- ANOVA	Higher scores in vocabulary recall and retention for Experimental group
2. What are learners' attitudes and reactions towards Spanish vocabulary learning in the two web-based environments?	- Attitudes scale (pre-scale) - Attitudes scale (post-scale)	- MANCOVA	More positive attitudes for Experimental group
3. What are learners' experiences when learning Spanish vocabulary in the two web-based environments?	- Learning experiences questionnaire	- Constant comparative method	
4. How do learners use a pedagogical agent when learning Spanish vocabulary?	- Chat scripts - Open-ended questionnaire	- Content analysis	

Table 2: Summary of data collection and analysis methods per research question

CONCLUSION

This chapter described the methodology used for this study, in which 47 university students enrolled in two fourth-semester Spanish courses participated. The study involved several types of data collection, including both quantitative data (demographic information, vocabulary pre-test and post-tests, attitudes scales), as well as qualitative data (questionnaires, chat scripts). The procedures used to analyze the data were also described in this chapter. The results of the study are presented in detail in the following chapter.

Chapter 4: Results

INTRODUCTION

This chapter presents the results of the present study. First, the results from the quantitative data are presented; beginning with the descriptive statistics related to demographic information from the two sets of participants, and then the results for Research Questions One and Two are presented. These sections are followed by the results from the qualitative data pertaining to Research Questions Three and Four.

QUANTITATIVE DATA

Demographic Information

The participants from both the Control group and the Experimental group (N = 47) were asked to complete an online questionnaire, which focused on background information of the participants, about two weeks before they were presented with the web-based environments. All the participants completed the questionnaire. Of the 47 participants, 30 (= 63.8%) were female learners and 17 (= 36.2%) were male learners. The average age was 20.6 years with a minimum of 18 and a maximum of 24. Of the 24 participants in the Control group, 14 (= 58.3%) were female learners and 10 (= 41.7%) were male learners. The average age was 20.54 with a minimum of 18 and a maximum of 24. With respect to the Experimental group, of the 23 participants, 16 (= 69.7%) were female learners and seven (= 30.4%) were male learners. The average age was 20.65 with a minimum of 19 and a maximum of 24. The following table contains a summary of these descriptive statistics.

Characteristic	<u>n</u>	%	<u>M</u>	<u>SD</u>
All Participants	47	100		
Female	30	63.8		
Male	17	36.2		
Average Age			20.60	1.45
Control Group	24	51.1		
Female	14	58.3		
Male	10	41.7		
Average Age			20.54	1.69
Experimental Group	23	48.9		
Female	16	69.6		
Male	7	30.4		
Average Age			20.65	1.19

Table 3: Participant characteristics

Major and GPA

The participants were asked to give information about their major at the university and their Grade Point Average (GPA). The participants typed in their major, while for their GPA they were asked to select one of the categories provided: less than 2.00, 2.00 – 2.49, 2.50 – 2.99, 3.00 – 3.49, 3.50 – 3.99, 4.00. For better presentation of the information, the majors were grouped according to the college offering them at the university. Of the 47 participants, 18 (= 38.3%) were grouped under the College of Liberal Arts. Their majors included Sociology, English, Linguistics, History, Government, Economics, Anthropology, and Spanish [only two participants of the 47 (= 4.3%), one in each of the two groups, were Spanish majors]. Of the total, 11 participants (= 23.4%) were grouped under the College of Communication and their majors included:

Communication Studies, Corporate Communications, Public Relations, Advertising, Radio–Television–Film, Communication Sciences and Disorders, and Political Communications. Seven participants (= 14.9%) were grouped under the College of Business, and their majors included: Accounting, Finance, and Business Administration. Another seven participants (= 14.9%) were grouped under the College of Natural Sciences, studying: Biology, Chemistry, Human Biology and Mathematics. Two of the participants (= 4.3%) were grouped under the College of Fine Arts, both with a major in Theater and Dance. Finally, one participant (= 2.1%) studying Early Childhood Education (in the College of Education), and one participant (= 2.1%) had not declared a major yet. This information, broken down according to the experimental and control groups, is presented in the following table.

College	All Participants		Control Group		Experimental Group	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Liberal Arts	18	38.3	7	29.2	11	47.8
Communication	11	23.4	6	25.0	5	21.7
Business	7	14.9	4	16.7	3	13.0
Natural Sciences	7	14.9	5	20.8	2	8.7
Fine Arts	2	4.3	1	4.2	1	4.3
Education	1	2.1	0	0.0	1	4.3
Undeclared	1	2.1	1	4.2	0	0.0
Total	47	100	24	100	23	100

Table 4: Participants' College at the university

With respect to the participants' GPA at the time the questionnaire was completed, of the 47 participants, none had a GPA of less than 2.00, two (= 4.3%) had a

GPA in the range of 2.00 – 2.49; 13 (= 27.7%) had a GPA in the range of 2.50 – 2.99; eight (= 17.0%) had a GPA in the range of 3.00 – 3.49; 21 (= 44.7%) had a GPA in the range of 3.50 – 3.99; and three (= 6.4%) had a GPA of 4.00. The following table presents this information, indicating the break-down for the Control group and the Experimental group.

GPA	All Participants		Control Group		Experimental Group	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Less than 2.00	0	0.0	0	0.0	0	0.0
2.00 – 2.49	2	4.3	1	4.2	1	4.3
2.50 – 2.99	13	27.7	7	29.2	6	26.1
3.00 – 3.49	8	17.0	3	12.5	5	21.7
3.50 – 3.99	21	44.7	11	45.8	10	43.5
4.00	3	6.4	2	8.3	1	4.3
Total	47	100	24	100	23	100

Table 5: Participants' GPA

Reasons for Studying Spanish

The participants were asked to indicate the reasons for which they were taking the specific Spanish course. The participants were given a list of choices and were allowed to choose as many reasons that applied. Of the 24 participants in the Control group, 20 (= 83.3%) indicated that they were taking the course in order to fulfill the foreign language requirement at the university; four (= 16.7%) indicated that they were taking the course in order to better communicate with their family; 16 (= 66.7%) indicated that they were taking the course in order to improve their bilingual skills for their current or future job;

one participant (= 4.2%) indicated that the reason was to improve his GPA; three (= 12.5%) indicated that they were taking the course in order to talk to their friends; equally, three (= 12.5%) indicated that they were taking the course in order to be able to watch Spanish language TV and films, or listen to Spanish language radio or music; four (= 16.7%) indicated that they were taking the course in order to be able to read Spanish language newspapers, magazines or books; equally, four (= 16.7%) indicated that they were taking the course to feel closer to their culture; and finally, three participants (= 12.5%) indicated that they were taking the course for other reasons, and listed those to be: the growing Hispanic population, a genuine interest in the language, and a genuine interest in the cultures of the Spanish-speaking world.

With respect to the Experimental group, of the 23 participants, 21 (= 91.3%) indicated that they were taking the course in order to fulfill the foreign language requirement at the university; 12 (= 52.2%) indicated that they were taking the course in order to improve their bilingual skills for their current or future job; two participants (= 8.7%) indicated that the reason was to improve their GPA; three (= 13.0%) indicated that they were taking the course in order to talk to their friends; five (= 21.7%) indicated that they were taking the course in order to be able to watch Spanish language TV and films, or listen to Spanish language radio or music; equally, five (= 21.7%) indicated that they were taking the course in order to be able to read Spanish language newspapers, magazines or books; and finally, three participants (= 13.0%) indicated that they were taking the course for other reasons, and listed those to be: the Hispanic population in the country, and travel. It should be noted that none of the participants in this group indicated that they were taking the course in order to communicate better with their family or feel closer to their culture. The results for both groups are presented in the following table.

Reason for Taking Course	Control Group		Experimental Group	
	<u>n</u>	%	<u>n</u>	%
Fulfill general language requirement	20	83.3	21	91.3
Better communicate with my family	4	16.7	0	0.0
Improve bilingual skills for current/future job	16	66.7	12	52.2
Improve my GPA	1	4.2	2	8.7
Talk to my friends	3	12.5	3	13.0
Listen/watch Spanish language TV/films/music	3	12.5	5	21.7
Read Spanish language newspapers/books	4	16.7	5	21.7
Feel closer to my culture	4	16.7	0	0.0
Other	3	12.5	3	13.0

Table 6: Reasons for taking Spanish

Experience with Technology

Part of the questionnaire sought information about the participants' experience with technology for academic and entertainment purposes. A series of questions aimed at collecting this type of information. First, the participants were asked to rate their overall skill with using technology in support of their academic practice, by choosing one of the following classifications: non-user, novice, intermediate, advanced, expert (often serve as a resource to others). Of the 47 participants in both groups, none rated themselves as non-user, four (= 8.5%) rated themselves as novice, 25 (= 53.2%) rated themselves as intermediate, 14 (= 29.8%) rated themselves as advanced, and four (= 8.5%) rated themselves as expert. The following table presents this information along with the specific break-down for each of the two groups.

Skill with Technology	All Participants		Control Group		Experimental Group	
	<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Non-user	0	0.0	0	0.0	0	0.0
Novice	4	8.5	1	4.2	3	13.0
Intermediate	25	53.2	14	58.3	11	47.8
Advanced	14	29.8	6	25.0	8	34.8
Expert	4	8.5	3	12.5	1	4.3
Total	47	100	24	100	23	100

Table 7: Participants' skill with technology

Then, the participants were asked to indicate whether they had ever used any pedagogical/intelligent agent or a virtual character for academic or entertainment purposes and if so, to also explain. Of the 24 participants in the Control group, five (= 20.8%) indicated that they had used a virtual character. In their explanation, one of the participants indicated that he had used one in Second Life for an English course, two of the participants indicated that they had used them as part of a software, one of the participants indicated that she had used a character for internet games, and the fifth participant did not give any explanation. Of the 23 participants in the Experimental group, none of them indicated that they had ever used an agent or an avatar.

Finally, the participants were asked to indicate which web-based applications/tools they had used for educational or entertainment purposes. The participants were given a list of choices and were allowed to choose as many tools that applied. Of the 24 participants in the Control group, 22 participants (= 91.7%) indicated that they had used an Internet website; 24 (= 100%) indicated that they had used an Internet search engine (e.g. Google, Yahoo, etc.); three (= 12.5%) indicated that they had

used an Internet / Online tutor; 16 (= 66.7%) indicated that they had used Internet / Online help tools; four (= 16.7%) indicated that they had used an Online discussion list; seven (= 29.2%) indicated that they had had experience with on Online / Web-based course (any type of educational course); one participant (= 4.2%) indicated that she had had experience with an Online / Web-based language course; nine participants (= 37.5%) indicated that they had used Internet language learning activities; and finally, 15 participants (= 62.5%) indicated that they had used an Online / Web-based game.

With respect to the Experimental group, of the 23 participants, 23 (= 100%) indicated that they had used an Internet website; 23 (= 100%) indicated that they had used an Internet search engine (e.g. Google, Yahoo, etc.); two (= 8.7%) indicated that they had used an Internet / Online tutor; eight (= 34.8%) indicated that they had used Internet / Online help tools; five (= 21.7%) indicated that they had used an Online discussion list; six (= 26.1%) indicated that they had had experience with on Online / Web-based course (any type of educational course); one participant (= 4.3%) indicated that he had had experience with an Online / Web-based language course; seven participants (= 30.4%) indicated that they had used Internet language learning activities; and finally, 12 participants (= 52.2%) indicated that they had used an Online / Web-based game. The information for both groups is presented in the following table.

Use of Web-based Tool	Control Group		Experimental Group	
	<u>n</u>	%	<u>n</u>	%
Internet website	22	91.7	23	100
Internet search engine	24	100	23	100
Internet / Online tutor	3	12.5	2	8.7
Internet / Online help tools	16	66.7	8	34.8
Online discussion list	4	16.7	5	21.7
Online / Web-based course	7	29.2	6	26.1
Online / Web-based language course	1	4.2	1	4.3
Internet language learning activities	9	37.5	7	30.4
Online / Web-based game	15	62.5	12	52.2

Table 8: Participants' use of web-based tools

Research Question 1: Effect on Vocabulary Recall and Retention

Does the presence of a pedagogical agent have an effect on vocabulary recall and retention?

The first research question sought to investigate whether the presence of the pedagogical agent in the web-based environment used by the Experimental group affected the performance of that group over the performance of the Control group in terms of vocabulary recall and retention. To investigate this, about two weeks before being introduced to the web-based environments, the participants in both groups completed a pre-test in order to identify any lexical items that they had already known, which were discarded from the lexical items presented in the web-based environments.

During the actual study period, the participants completed online activities that helped them practice two sets of vocabulary items. After completing the activities on

each treatment day, participants completed two immediate post-tests. On the first day, the participants completed a post-test that tested their knowledge of the first set of words presented in the web-based environments (words 1-20). On the second day, the participants completed a second post-test (same format as on day one), which tested their knowledge of the second set of words presented (words 21-40). About fifteen days later, a delayed post-test including all 40 lexical items was administered to the participants of both groups. The following table presents the mean scores and standard deviation for the two groups for each of the post tests: immediate post-test day 1, immediate post-test day 2, delayed post-test word group 1, delayed post-test word group 2.

Test	Control Group		Experimental Group	
	<u>M</u>	<u>SD</u>	<u>M</u>	<u>SD</u>
Immediate Post-test: Day 1 (Word group 1)	17.92	4.14	17.83	3.55
Immediate Post-test: Day 2 (Word group 2)	16.62	3.72	16.87	3.45
Delayed Post-test: Word group 1	14.04	5.22	12.83	4.10
Delayed Post-test: Word group 2	14.25	3.75	15.00	2.56

Table 9: Mean scores and standard deviation for immediate and delayed post-tests

To determine whether there was a difference in vocabulary recall and retention between the two groups, a two-way repeated-measures Analysis of Variance (ANOVA) was conducted on students' performance on each of the two immediate-recall vocabulary post-tests, as well as on their performance on the delayed post-test. This specific measure was chosen in order to account for the differences between the two groups of participants with respect to the effects of time on their recall and retention of the two sets of words. The within-subjects factors were time, with two levels (immediate and delayed), and word group, with two levels (group 1 represented the first set of words and group 2

represented the second set of words). The between-subjects factor was the group of the participants (Control and Experimental). The level of confidence for this statistical analysis was set at .05.

Both groups demonstrated substantial vocabulary learning outcomes as observed from the immediate post-tests. The mean scores for the Control group were: Immediate Post-test Day 1 = 17.92; Immediate Post-test Day 2 = 16.62. The mean scores for the Experimental group were: Immediate Post-test Day 1 = 17.83; Immediate Post-test Day 2 = 16.87. Furthermore, both groups were able to retain a substantial amount of the new lexical items as demonstrated on the delayed post-test completed fifteen days later. The Control group retained 78.3% of the lexical items presented on Day 1 and 85.7% of the lexical items presented on Day 2. The Experimental group retained 72% of the lexical items presented on Day 1 and 88.9% of the lexical items presented on Day 2.

The Analysis of Variance however, did not show any significant between-subject effect ($p = .935$) as indicated in the table below. This suggested that there was no significant difference in the performance of the two groups of participants with respect to their recall and retention of the lexical items presented in the two web-based environments. As a result, this analysis suggested that the presence of the pedagogical agent in the web-based environment used by the Experimental group did not significantly affect learners' performance compared to the performance of the Control group.

Tests of Between-Subjects Effects					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	46138.668	1	46138.668	1.089E3	.000
group	.285	1	.285	.007	.935
Error	1907.268	45	42.384		

Table 10: Analysis of Variance – Between-Subjects Effect

A significant effect was observed with respect to the time factor ($p = .000$). This suggested that there was significant change in *all* learners' retention of the lexical items from the time of the immediate post-test to the time of the delayed post-test. This significant change applied to both the Control group and the Experimental group, as retention decreased significantly over time for both groups. Both groups of participants retained fewer vocabulary items, as indicated by the results on the delayed post-test than they had recalled on the immediate post-tests. This result is presented in the following figure.

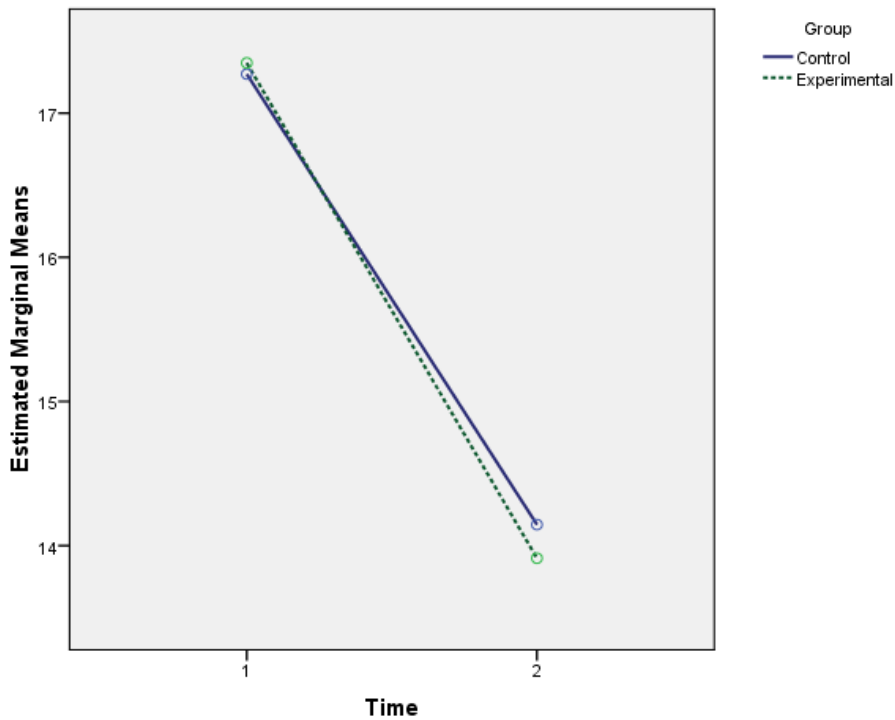


Figure 1: Test scores over time

In an attempt to analyze further the effect of time, tests of within-subjects effects were conducted. These tests indicated a significant effect in terms of the within-subject factors of time and the two word groups ($p = .001$). This suggested that there was an effect in the amount of words per word group as retained over time. Lexical items included in the second word group (set of words presented on the second day) were retained by both groups of participants at a higher rate than those of the first word group. Even though overall retention decreased for both word groups over time, the lexical items included in the second word group were retained at a higher rate than those included in the first word group. This could be due to the fact that by the second learning session

learners had already got accustomed to the web-based environments and the procedures that should be followed, thus using their time more efficiently to learn the words. These results are presented in the table and figures below.

Tests of Within-Subjects Effects						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	
time	505.382	1	505.382	75.236	.000	
time * group	1.127	1	1.127	.168	.684	
Error(time)	302.277	45	6.717			
word group	.053	1	.053	.008	.928	
word group * group	15.542	1	15.542	2.408	.128	
Error(word group)	290.437	45	6.454			
time * word group	62.954	1	62.954	13.229	.001	
time * word group * group	7.805	1	7.805	1.640	.207	
Error(time* word group)	214.152	45	4.759			

Table 11: Analysis of Variance – Within-Subjects Effects

At word group 1

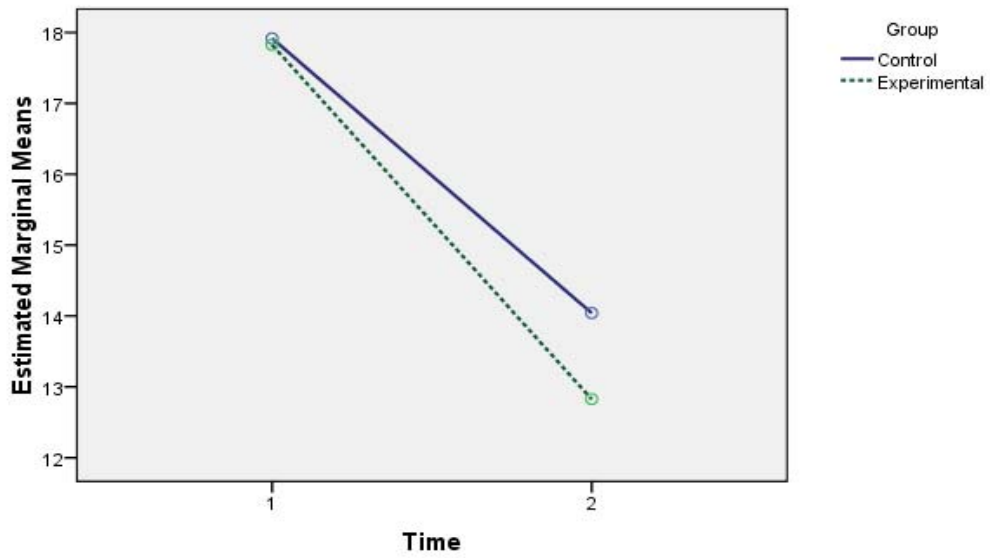


Figure 2: Test scores over time for word group 1

At word group 2

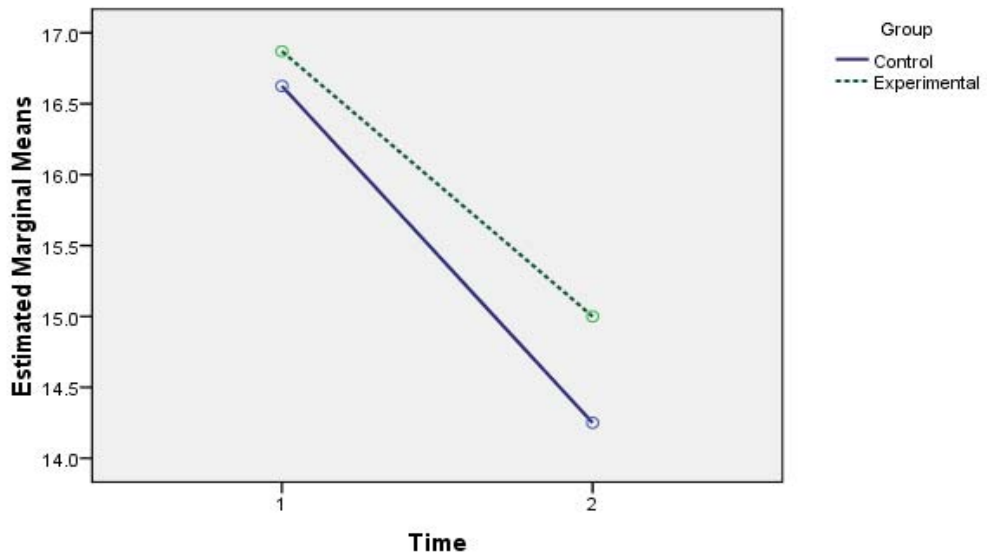


Figure 3: Test scores over time for word group 2

Research Question 2: Learners' Attitudes towards Spanish Vocabulary Learning

What are learners' attitudes and reactions towards Spanish vocabulary learning in the two web-based environments?

The second research question sought to investigate differences in the learners' attitudes towards Spanish vocabulary learning after their learning experience with the web-based environments. The participants completed an attitudes scale prior to their exposure to the web-based environments (pre-scale) and they completed another attitudes scale after the two days they spent learning new vocabulary by using the web-based environments (post-scale). Both scales were rated from 1 (Strongly Disagree) to 5 (Strongly Agree). The pre-scale consisted of four questions, each one focusing on the participants': (1) interest in learning new vocabulary in Spanish, (2) enjoyment in learning new vocabulary in Spanish, (3) motivation to learn new vocabulary in Spanish, and (4) confidence in using new vocabulary in Spanish. The post-scale consisted of nine questions, focusing on the same four types of attitudes depicted on the pre-scale but elaborated through different questions.

To determine whether there were any differences between the participants' attitudes in the two groups (Control and Experimental) a Multiple Analysis of Covariance (MANCOVA) was conducted. The homogeneity of regression slopes was calculated at .767, which allowed for the MANCOVA to be run. The four categories on the pre-scale were treated as covariates by adding them up in order to yield a composite/index score for prior vocabulary learning attitudes for each participant. The nine items on the post-scale were used as dependent variables in the multiple analysis of covariance. The level of confidence for this statistical analysis was set at .05.

The analysis did not reveal any significant differences between the two groups (Wilks' Lambda = .835, $F = .788$, $p = .629$) as indicated in the table below. This

suggested that there were no significant differences between the two groups in terms of their attitudes towards vocabulary learning. Even though, some of the learners' positive attitudes increased after their learning experience with the web-based environments, the change was not significant so as to cause a main effect.

Effect	Value	F	Hypothesis df	Error df	Sig.	Observed Power ^b
Group Pillai's Trace	.165	.788 ^a	9.000	36.000	.629	.322
Wilks' Lambda	.835	.788 ^a	9.000	36.000	.629	.322
Hotelling's Trace	.197	.788 ^a	9.000	36.000	.629	.322
Roy's Largest Root	.197	.788 ^a	9.000	36.000	.629	.322

Table 12: Multiple Analysis of Covariance

As an additional step, in order to determine whether there were any *changes* over time between the participants' attitudes in the two groups (Control and Experimental) a Multiple Analysis of Variance (MANOVA) was conducted. The objective was to investigate significant changes with respect to the four attitudes examined by the attitudes scales – (1) interest in learning new vocabulary in Spanish, (2) enjoyment in learning new vocabulary in Spanish, (3) motivation to learn new vocabulary in Spanish, and (4) confidence in using new vocabulary in Spanish. In order to be able to carry out the analysis, the nine items on the post-scale were grouped under these four categories based on the focus of each one of the nine items. The level of confidence for this statistical analysis was set at .05.

The analysis did not reveal any significant between-subject effect ($p = .272$ for interest; $p = .798$ for enjoyment; $p = .154$ for motivation; and $p = .429$ for confidence) as indicated in the table below. This suggested that there were no significant differences

between the two groups of participants in terms of changes in their attitudes towards vocabulary learning, as determined by the four factors chosen (interest, enjoyment, motivation, confidence) before and after their learning experience with the web-based environments.

Tests of Between-Subjects Effects						
Source	Measure	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	Interest	1532.188	1	1532.188	2164.039	.000
	Enjoyment	1401.611	1	1401.611	1176.217	.000
	Motivation	1264.298	1	1264.298	1138.358	.000
	Confidence	1121.972	1	1121.972	1027.571	.000
group	Interest	.876	1	.876	1.237	.272
	Enjoyment	.079	1	.079	.066	.798
	Motivation	2.341	1	2.341	2.108	.154
	Confidence	.696	1	.696	.637	.429
Error	Interest	31.861	45	.708		
	Enjoyment	53.623	45	1.192		
	Motivation	49.978	45	1.111		
	Confidence	49.134	45	1.092		

Table 13: Multiple Analysis of Variance – Between-Subjects Effect

QUALITATIVE DATA

Research Question 3: Learning Experiences in the Web-based Environments

What are learners' experiences when learning Spanish vocabulary in the two web-based environments?

The third research question sought to investigate the learners' experiences, thoughts and reflections while using the web-based environments in order to learn Spanish vocabulary. At the end of the intervention, both groups of participants were asked to complete an online questionnaire regarding their learning experience with the environments. The questionnaire for the Control group was comprised of six questions focusing on: what the participants liked and disliked about the environments; what aspects they found to be the most and least engaging; what aspects they found to be the most and least helpful; whether they considered the environment to be effective in their learning process; whether they would be willing to use it on a regular basis as part of the language course; and any additional comments they had. The questionnaire for the Experimental group was comprised of the same six questions with the addition of one question regarding their reactions to the presence of Laura, the agent, in the environment and her effect on their learning process. The data from the questionnaires were analyzed based on the model of the constant comparative method (Glaser & Strauss, 1967) and the following categories arose with respect to the participants' learning experiences.

Learner Performance

Most of the learners expressed overall satisfaction with the web-based environments, stating that the features found in *both* environments helped them engage more with the material and thus increased their retention of the vocabulary. More specifically, of the 24 participants in the Control group, a total of 21 (= 87.5%) indicated

that the learning environment was completely successful or somewhat successful in advancing their performance with the specific course unit. The same observation was true for a total of 20 out of the 23 participants (= 87%) in the Experimental group.

One participant from the Control group stated: “I felt it was very effective and not only helped me learn the words but also understand how to pronounce the words.” [SC7], while another participant from the same group stated: “I found it effective because I definitely found myself concentrating on learning vocabulary.” [SC8] Another participant from the same group even evaluated the effect of her performance with respect to vocabulary retention, by expressing: “I liked using the web-based environment to learn Spanish vocabulary. I found it effective because I was able to retain the vocabulary from completing the exercises.” [SC10]

Similar comments were observed among the participants in the Experimental group. One of them stated: “It was effective because it was more engaging than just looking in a book. It required more attentiveness.” [SE22] while another participant explained: “I really think that this is an effective way to learn Spanish vocabulary. You get to hear the words, see the words, and write about the words. It covers everything you need to do to really learn new words.” [SE6] Another participant even commented on the interactive aspect of the environment as contributing to her success in learning the vocabulary:

I felt confident in using it, if I had more time with it on an individual basis perhaps, even more so. Or it would be helpful to interact with Laura more since she is speaking - my vocabulary becomes more set in stone for me after memorization and actually using it, or hear myself say it. I found it very effective, and it's a great resource for onsite teaching and learning. [SE8]

When the participants were asked whether they would use the web-based environment if it were available as part of the course (for example, for each thematic unit of the textbook), 20 participants from the Control group (= 83.3%) and 22 participants

from the Experimental group (= 95.7%) answered that they would use it, either on a frequent or an occasional basis. They also proposed possible ways of using the web-based environment as part of the course, which included: preparing for quizzes and tests, learning the vocabulary, using it for extra practice and feedback, having it as a complement to other learning tools and resources, hearing the pronunciation, using it to improve speaking skills. One participant from the Control group specifically mentioned: “Yes, I like having different learning options. It is more interesting and I would study longer without getting bored. I also like the interactive nature of the program.” [SC7] while another participant, also from the Control group, indicated: “Yes, I would use it. The activities do help increase retention.” [SC2] One participant from the Experimental group was more vocal in expressing preference towards the web-based environment over the textbook website by stating: “I definitely would use this environment. It really helps you ingrain the words into your mind. I already utilize the book's online resources, and I feel this is far more helpful than anything the book's online resources provide.” [SE6]

The participants who did not find the web-based environments successful in helping them learn the vocabulary items provided reasons such as the short amount of exposure time they had with the environments, and their own styles and preferences with respect to vocabulary learning. The latter is discussed in the following section.

Distinct Learning Styles and Preferences

Learners are usually aware of their personal learning style(s) and preferences and sometimes tend to attribute learning success or failure to whether material presented in the language classroom matches their learning style(s). While most learners in this study reacted favorably to interacting with the web-based learning environments, some did not find them appealing, because they had been used to learning vocabulary in more

traditional techniques and would rather continue on that route. The most prevalent technique mentioned was the use of flashcards. Some learners seemed to consider that route as the most appealing to their style, while others felt relieved to be given the opportunity to succeed in vocabulary learning without having to use flashcards. The issue of distinct learning styles as a possible cause for their learning success or failure was observed in both groups.

Some learners found that the web-based environment was compatible with their learning style. One participant from the Control group stated: “I liked the web environment because it’s different than just studying vocab. with flashcards and the exercises help you practice and learn the words.” [SC21] while another participant from the same group stated: “I think this type of activity with the vocab words from each chapter could help students better understand how to use the words in sentences.” [SC23]

Some participants from the Experimental group were more explicit in mentioning the compatibility of the web-based environment with their learning style(s). One participant stated: “I did find it [the environment] helpful. It is a good combination of the three learning styles (auditory, visual, and tactile).” [SE12] while another participant mentioned: “I really enjoyed it rather than looking at definitions in our book and having to make flashcards.” [SE14]

Furthermore, some learners from both groups mentioned that they appreciated learning at their own pace. For example, one participant from the Control group expressed that the most engaging aspect of the web-based environment was that “it was self-paced; sometimes it’s nice to go at your own pace because everyone learns at different rates.” [SC10]

On the other hand, some learners had a completely different reaction to the use of the web-based environments and were explicit in stating that they were not as appealing

to them because they have different learning styles and above all, prefer the use of flashcards or prefer to interact with other learners in a regular classroom setting. One participant from the Control group explained: “I am not excited about it [the environment] but that may be because of my specific learning style. Especially for learning a language, I like to be engaged with others when learning.” [SC5] She also added, “I tend to not pay attention to the computer, I find it boring. It is much more fun and engaging to learn with other people and actually speak the words.” [SC5]

One participant from the Experimental group stated: “I didn't feel like I really learned the material well because it was such short time, and I learn vocabulary better using things like flashcards.” [SE19] while another participant from the same group explained that “if you are a visual person that learns by using flashcards then I would recommend you use flashcards to help you learn the vocabulary. Listening to Laura does nothing for me. I learn more so by reading over the words before I move onto the next lesson.” [SE10] In addition to their distinct learning styles, learners from both groups also attributed likes and dislikes towards the web-based environments to their audiovisual preferences as described in the following section.

Audiovisual Preferences

Learners have different reactions to the use of audio, or the use of visual aids, or the combination of the two elements. In this study, learners in both groups expressed that the audio element was successful in advancing their overall performance. However, with respect to the presence of the agent in the web-based environment used by the Experimental group, it was observed from the responses on this questionnaire that it did not necessarily play a significant role in the learning process.

Many students from both groups expressed positive feelings towards the audio feature of the web-based environments. They mentioned that it was beneficial in their exposure to the vocabulary items, their processing of the information, their awareness of the vocabulary item's pronunciation, and their retention of the vocabulary, because it provided an additional input besides solely looking at the text on the screen. One participant from the Control group stated: "The audio and the examples of use were the most helpful because they helped me remember the meaning more." [SC4] She also added: "I liked the new words that I learned and the audio that was used to aid in the retention of the words. I used to have difficulty recalling some words that I didn't really know but now I remember them." [SC4]

Similar reactions were observed in the Experimental group as well. One participant wrote: "I liked that there was audio to hear how the word was actually pronounced." [SE1] while another participant from the same group indicated that the audio portion was the most engaging aspect of the web-based environment, because "it's not only telling you the word and the definition, but an example on how to use it." [SE8] A third participant from the same group even proposed to "include a short dialogue where the words (some of them at least) are used between two speakers so that I can hear them in context." [SE7]

An interesting finding was that some learners from both groups noted that they liked "how the environment included a native speaker to pronounce the words", while at the same time others (from both groups) mentioned that, even though they liked the audio feature of the web-based environments, they felt that the quality of the voice needed to be improved and proposed making the voice less robotic, slower, and clearer. Even though a couple of learners mentioned that the audio was too fast and they would prefer it to be a bit slower, one learner from the Experimental group commented that Laura "spoke

quickly which was good and I got to hear how the words are actually pronounced, not how I imagine they might be pronounced.” [SE15] Most learners expressed that they liked reading the text and hearing the pronunciation at the same time. A few learners (from both groups) also suggested including audio for the definition of the new vocabulary in English “to help you make that connection.”

In terms of Laura’s presence on the web-based environment of the Experimental group, only five learners (= 21.7%) expressed that they did not find her helpful or effective in the learning process. They either attributed that to her not appealing to their learning style, or they pointed out that she was not truly necessary for them given the rest of the features that were available, such as the audio and text. The rest of the students had either positive or somewhat positive comments. Most of them commented that they liked hearing Laura pronounce the words. For example, one participant stated: “[I] found her to be pretty helpful in case there was confusion on the pronunciation of a word.” [SE4] while another participant explained that “just being able to listen to her and read along at the same pace that she was talking was helpful rather than just hearing someone speak and trying to pick out words or phrases that I'm familiar with.” [SE8]

Four learners (17.4%) from the Experimental group thought that the animated presence of Laura was interesting and appealing, but not a necessary part of the learning process. One of the participants said that he “found the audio portion of Laura helpful, but could have done without her following my cursor moves.” [SE1] while another participant found her voice effective “but did not really pay attention to the interactive version of her.” [SE18] Furthermore, a third participant stated: “She was engaging and it added a little bit of entertainment to the learning process. It was helpful in that way.” [SE22] while a fourth participant expressed: “I think Laura was pretty effective but I feel you could have anything reading the definitions and it would be helpful. You don't

necessarily need to see her.” [SE6] Participants from both groups offered comments to expand on some aspects that they liked or disliked with respect to the environments. These were beneficial as they contribute to future research and implications for similar tools, as described in the following section.

Future Implications for Spanish Courses

An interesting finding that emerged from the data analysis was that learners from both groups, voluntarily offered suggestions for improvement of the web-based environments, based on their own personal learning preferences, as well as potential future uses of the environments for enhancing language learning. What’s more, the suggestions offered were consistent with learners’ dislikes or concerns with respect to the environments or their own learning performance, and were perceived as attempts for benefiting the most from the potential of an improved web-based environment.

Two learners, one from the Control and one from the Experimental group, suggested that a game-based format of the learning environment or an addition of an interactive game component would assist in increasing retention even more. For example one of the two participants stated: “I think there should be some sort of game added to the learning, perhaps a crossword or matching, just something to keep the student even more engaged.” [SE3]

Going back to the idea of learning styles, specifically for visual learners, some participants from both groups recommended the use of images to accompany the lexical items or other forms of visual aids. For example, one participant from the Control group mentioned that he “would like to have some different features other than the audio, for example pictures or a story or something that would create a deeper impact and association factor” [SC15], while another participant wrote: “I wish there could have

been pictures associated with the words because I would think that some people are visual learners when it comes to vocabulary.” [SC19]

As mentioned in the previous section, some learners considered that the quality of the audio could be improved, so as to sound a bit more natural, but also to perhaps have the native speaker speak a bit slower. The quality of audio associated with avatar software has greatly improved through technological advances in the last decade in terms of how natural and human-like it sounds, but could still become better.

Another limitation mentioned in the first section was the amount of time the learners were exposed to the web-based environments. Some learners suggested having more time to work with the environments, and having them available at home so as to benefit the most from them. Given the design of this study, this is indeed a limitation, and the recommendation for such type of environments would in fact be for them to accompany language textbooks, and thus be available to learners at all times. As a participant in the Experimental group expressed, “this was a good activity and I would like to have it accompany my textbook.” [SE1]

Finally, a couple of learners in the Experimental group had suggestions specific to Laura, the agent. One participant suggested the availability of other agent designs from which the learner could choose, varying in gender, as well as origin, thus giving the learner access to a variety of accents from the Spanish-speaking world. This participant indicated: “...having different characters to choose from, male and female - and perhaps from different parts of the world with different accents as a way to help identify them.” [SE8] Another participant suggested additional roles for the agent, not just limited to vocabulary teaching. This participant suggested that a cultural component be incorporated in the unit, with the agent providing general cultural information and perspective with respect to her country of origin, along with sociolinguistic information.

These suggestions, from learners who have experienced the web-based environments as a tool for vocabulary learning, are significant and should be taken into account by researchers and educators who are interested in utilizing agents or other audiovisual elements in web-based learning environments.

Research Question 4: Learners' Use of the Pedagogical Agent

How do learners use a pedagogical agent when learning Spanish vocabulary?

Research question four sought to explore how the learners in the Experimental group used the pedagogical agent in their attempt to learn the Spanish lexical items presented on the web-based environment. The learners were asked to chat with Laura, the agent, because she would be able to help them learn the lexical items. This occurred during a second phase of the learning process. The conversational component was added to the environment of the Experimental group after the delayed post test was completed by both groups. All of the participants in the Experimental group (n = 23) chatted with her as part of their vocabulary learning process. The chat scripts were saved and analyzed through content analysis (as described in Gall, Gall, & Borg, 2003) in an attempt to identify some themes that characterize the learners' behavior with and use of the agent. The following themes emerged from the data analysis. Excerpts from the chat scripts of some learners' sessions with Laura can be found in Appendix H.

Vocabulary in Context

The majority of the learners held conversations with the agent about the vocabulary, by using the lexical items in context; either by asking a general question that incorporated a specific lexical item, or by asking the agent for her opinion about the idea

or topic presented by a lexical item, or by giving the agent a situation and asking her to apply the word and use it in the context of the specific situation. Of the 23 learners, 13 (= 56.5%) used the vocabulary in context by asking Laura a question and trying to hold a conversation that either used a lexical item, or was specifically about the topic expressed by the lexical item. For example, for the verb “recaudar” (*to raise money/funds*) one of the participants asked Laura “¿Cuándo recaudaste dinero?” (*When did you raise money?*). For the adjective “innovador” (*innovative*), a participant asked Laura “¿Eres innovadora? ¿Cómo lo es?” (*Are you innovative? How?*). For the verb “enriquecer” (*to enrich*), another participant asked Laura “¿Es posible enriquecer la educación de una persona?” (*Is it possible to enrich someone’s education?*). For the adjective “polémico/a” (*controversial*) a participant asked Laura “¿Qué es un tema polémico en tu opinión?” (*What topic is controversial in your opinion?*)

Definitions

Even though many learners chose to enhance their vocabulary learning experience with Laura by using the vocabulary in context, others opted to ask her for the definition of specific lexical items or what they meant. Although a definition and an example were provided on the web-based environment for each of the lexical items, ten learners (= 43.5%) asked Laura for the meaning or the definition of lexical items. If the definition given to them was the same as the one given in the web-based environment itself, some of the learners asked her for an alternative definition, or a different way of explaining the meaning of the word. For example, for the verb “brindar” (*to offer*) one participant asked Laura “¿Qué significa la palabra ‘brindar’?” (*What does the word “brindar” mean?*). When Laura replied by giving her the definition that was already on the environment

[“Ofrecer algo a alguien” (*To offer something to someone*)], the learner asked her “¿Qué es otra manera de explicar la palabra?” (*What is another way to explain the word?*).

Characteristics of the Vocabulary

Beyond the definition and an example of each lexical item being used in context, some learners preferred to ask Laura more specific questions about the lexical items, such as their linguistic structure or synonyms. With respect to the structure of the words, two participants (= 8.7%) asked Laura to explain what part of speech a specific word was (if it was a verb or an adjective), or they wanted to know what the verb form would be for a word that was given on the web-based environment as a noun. For example, for the word “el porvenir” (*future*) one participant asked Laura “¿Hay un verbo para la palabra ‘porvenir’?” (*Is there a verb for the word ‘porvenir’?*). Similarly, two participants (= 8.7%) were interested in learning about the synonyms and antonyms of specific vocabulary items as part of their learning process. They therefore asked Laura to provide them with this information. For example, one of the participants made a general request by asking Laura “¿Puedes usar más sinónimos y antónimos?” (*Can you use more synonyms and antonyms?*), while the other participant specifically wanted to have synonyms for the word “la novedad” (*novelty*) and therefore asked Laura “¿Qué es un sinónimo de la novedad?” (*What is a synonym for ‘la novedad’?*). Finally, one participant (= 4.3%) was interested in understanding the function of the prefix “des-” and whether it always had the same function. She asked Laura “¿Cuando una palabra empieza con ‘des’ significa algo negativo, significa que no?” (*When a word starts with ‘des’, does it mean something negative, does it mean not?*). Unfortunately, Laura was not able to reply to this question.

Vocabulary Learning Strategies

As many learners asked Laura questions involving the vocabulary at hand, two of the participants (= 8.7%) opted for more general help with vocabulary learning. They asked Laura for strategies in order to learn or remember the vocabulary. For example, one of them asked her *¿Qué debo hacer para entender las palabras nuevas?* (*What should I do in order to understand the new words?*), and followed her question by also asking *¿Qué debo hacer para recordar las palabras nuevas?* (*What should I do in order to remember the new words?*). Similarly, the other participant asked her *¿Cuánto y cómo debo estudiar el vocabulario?* (*How much and how should I study the vocabulary?*). Laura did not have the required knowledge to reply to these questions. It was however, surprising to see that the learners were asking her for help with their learning strategies. I had not anticipated that they would use the tool for something beyond practice with the vocabulary at hand and this was a pleasantly surprising finding.

Personal Questions

As expected, some of the learners were interested in learning more information about Laura herself and therefore asked her various personal questions. 15 of the participants (= 62.5%) incorporated some type of personal question in their conversation. The learners usually started their conversation on-task, asking about the vocabulary, then they asked Laura some personal questions and then they went back to the task and asked her about the vocabulary once more. Only three of these 15 participants (= 20.0%) asked her only a couple of questions on the vocabulary and focused the majority of their questions on her personal information, while the rest asked an equal amount of questions on the vocabulary and personal information about her. Some examples of questions the learners asked Laura were: *¿De dónde eres?* (*Where are you from?*) *¿Cuántos años*

tienes? (*How old are you?*) ¿Te gusta el español? (*Do you like Spanish?*) ¿Tienes un perro? (*Do you have a dog?*) ¿Cuál es tu color favorito? (*Which is your favorite color?*) and ¿Cuál es tu película favorita? (*Which is your favorite movie?*).

The following excerpt from the chat script between Laura and one of the learners (SE 16) exemplifies a short but sustained conversation related to personal information about Laura, in which the learner shows interest and sympathy for her. A translation is provided next to each utterance. It should be noted that the learner does not use any accent marks or special characters, which might have contributed to why the agent understood most of the utterances but not all of them; especially those that involved the word “yes” which the learner wrote as “si” (which means “if”) instead of “sí”.

Human: Como estas? [*How are you?*]

Laura - Spanish: Estoy bien, gracias por preguntar. ¿Y tú? [*I am fine, thanks for asking. And you?*]

Human: Muy Bien [*Very well*]

Laura - Spanish: Perfecto. [*Perfect.*]

Human: Te gusta espanol? [*Do you like Spanish?*]

Laura - Spanish: Sí. A ti también te debe gustar, ¿no? [*Yes. You must like it as well, right?*]

Human: si me gusta espanol [*Yes i like Spanish*]

Laura - Spanish: ¿Y por qué te gusta? [*And why do you like it?*]

Human: porque quiero ser mexicano [*Because I want to be a Mexican*]

Laura - Spanish: ¿Realmente quieres eso? [*Do you truly want that?*]

Human: Si [*Yes*]

Laura - Spanish: Bueno, si tú lo dices. [*Well, if you say so.*]

Human: Y tu? [*And you?*]

Laura - Spanish: ¿Yo? ¿Qué quieres saber de mí? [*Me? What do you want to know about me?*]

Human: Por que te gusta espanol? [*Why do you like Spanish?*]

Laura - Spanish: No se el porqué, lo siento. [*I don't know why, i'm sorry.*]

Human: esta bien *[It's OK]*

Laura - Spanish: Perfecto. *[Perfect.]*

Human: Conoces katerina? *[Do you know Katerina?]*

Laura - Spanish: Lo siento pero no te entendí. ¿Podrías indicarme cuál sería la respuesta correcta? *[I'm sorry but I didn't understand you. Could you please indicate to me what would be the correct answer?]*

Human: como se dice hello en espanol *[How do you say "hello" in Spanish?]*

Laura - Spanish: Katerina tan sólo me hizo para poder responder en español. *[Katerina made me able to answer only in Spanish.]*

Human: A si lo siento *[Oh yes, i'm sorry]*

Laura - Spanish: Lo siento, pero no te entendí. ¿Puedes modificar lo que escribiste por favor? *[I'm sorry, but i didn't understand you. Could you please modify what you wrote?]*

Human: Te gusta Juanes? *[Do you like Juanes?]*

Laura - Spanish: Sí. ¿A tí te gusta Juanes? *[Yes. Do you like Juanes?]*

Human: Si mucho? *[Yes, a lot]*

Laura - Spanish: ¿Por qué crees que es demasiado? *[Why do you think it's a lot?]*

Human: Conoces Juanes? *[Do you know Juanes?]*

Laura - Spanish: ¡Me parece interesante! *[It sounds interesting.]*

These were the main ways in which the learners used Laura and as a result these were the main categories that arose from the data analysis of the chat scripts. With respect to the short questionnaire that learners in the Experimental group were asked to complete after chatting with Laura, the themes that arose evolved around both positive and negative comments towards the conversational component.

Positive comments included appreciation of her interactive aspect, enjoyment of the innovation behind this feature, as well as personal accomplishment and satisfaction for maintaining a conversation with someone perceived as being more proficient in the language. One participant commented: "It was cool. I asked her some things that I didn't think she could answer and she did which was really cool." [SE16], while another participant expressed: "I enjoyed the interaction with Laura, and I was thankful she could

understand my questions even if they weren't in perfect Spanish.” [SE5]. A third participant stated: “I think this learning tool is innovative and is a great way to learn and reinforce vocabulary.” [SE20] One of the participants elaborated on the role of Laura by stating: “I liked chatting with Laura. I felt that she was an easy tool to ask questions and responded to them better than I had imagined. This seems more convenient than getting the teacher’s attention and also necessary if one is not available in the class room.” [SE1]

Negative comments included frustration with accent marks that needed to be included for comprehension to be achieved by the agent, and more prominently, frustration with the limited knowledge the agent depicted. Even though most of the time the agent was able to recognize words and utterances without the use of accent marks or the correct punctuation (as proven by the excerpt above, in which no accent marks and special punctuation marks were used by the learner), sometimes the agent could not recognize the words, in which case the conversation failed. With respect to the accent marks, one participant commented: “Before chatting with Laura students should know how to place accents marks and all the upside down punctuation marks.” [SE21], while another participant suggested having “a "map" or something at the top of the page that showed how to choose Spanish letters with the accents on a non accented computer.” [SE23] In terms of the frustration that arose due to the limited knowledge that Laura demonstrated with respect to topics or responses that were not at the moment included in her knowledgebase, one participant stated: “I think that someone needs to go into the database and fix her faults because she does not understand a lot of the questions that are being asked.” [SE10] Another participant commented: “...it made me slightly frustrated because many times she couldn't understand what I was saying, even if the sentence was a simple one.” [SE18], while another participant expressed his frustration by stating: “It was like talking to a wall. She couldn't understand much.” [SE12]

As this component of the study was exploratory and the knowledge base of the agent was a work in progress at the time, these negative aspects were anticipated. The concerns raised by the participants were very useful in understanding the limitations of the pedagogical agent in terms of its design at the moment and these weaknesses will be addressed and fixed before Laura is implemented in a learning environment in the future.

CONCLUSION

This chapter presented the results both from the quantitative data (demographic information, vocabulary pre-test and post-tests, attitudes scales), and from the qualitative data (questionnaires, chat scripts). The results for each research questions were reported and briefly discussed. These results are summarized and discussed in detail in the following chapter.

Chapter 5: Discussion and Conclusions

INTRODUCTION

This chapter first summarizes the findings of the study and then discusses the results. This is followed by a list of the limitations of the study, implications of the study, recommendations for future research, and concluding remarks.

SUMMARY OF MAJOR FINDINGS

The purpose of this study was to investigate the effects of an animated pedagogical agent in Spanish vocabulary learning. Furthermore, the study attempted to examine learners' reactions and attitudes towards the presence of the pedagogical agent in the web-based environment, as well as how the learners used the conversational component of the pedagogical agent in their learning process.

A total of 47 university students enrolled in two fourth-semester Spanish courses participated in this study. Both the Control group (comprised of 24 students) and the Experimental group (comprised of 23 students) used a web-based environment that presented new vocabulary (in audio and text), along with activities for practicing the vocabulary. The difference between the two groups was that an animated pedagogical agent (Laura) was present in the environment used by the Experimental group. In addition, a conversational component was added at a second phase to the environment used by the Experimental group, which the learners used to chat with the pedagogical agent with respect to the material presented in the environment.

The data were analyzed through quantitative and qualitative methods. The quantitative data were derived from a demographic information questionnaire, a vocabulary pre-test and two vocabulary post-tests (an immediate post-test and a delayed

post-test), as well as from attitudes scales completed prior to the learners' exposure to the web-based environments and after completing the learning sessions.

The major findings in this study are summarized below with respect to the four research questions under investigation.

Research Question 1: Effect on Vocabulary Recall and Retention

Does the presence of a pedagogical agent have an effect on vocabulary recall and retention?

The first research question sought to investigate whether the presence of the animated pedagogical agent on the web-based environment used by the Experimental group affected the learning outcomes of that group over those of the Control group with respect to vocabulary recall and retention.

Both groups had significant learning outcomes as demonstrated on the immediate post-tests. The mean scores for the Control group were: Immediate Post-test Day 1 = 17.92; Immediate Post-test Day 2 = 16.62. The mean scores for the Experimental group were: Immediate Post-test Day 1 = 17.83; Immediate Post-test Day 2 = 16.87. Furthermore, both groups were able to retain a substantial amount of the new lexical items as demonstrated on the delayed post-test completed two weeks later. The Control group retained 78.3% of the lexical items presented on Day 1 and 85.7% of the lexical items presented on Day 2. The Experimental group retained 72% of the lexical items presented on Day 1 and 88.9% of the lexical items presented on Day 2. It can be concluded that learners in both groups experienced successful vocabulary learning and both environments yielded successful results in terms of learning outcomes.

However, in order to address the objective of this research question, a two-way repeated measures Analysis of Variance (ANOVA) conducted on students' performance

on the immediate and delayed post-tests showed no significant between-subject effect ($p = .935$), suggesting that the presence of the pedagogical agent did not have any significant effect on learning outcomes.

Research Question 2: Learners' Attitudes towards Spanish Vocabulary Learning

What are learners' attitudes and reactions towards Spanish vocabulary learning in the two web-based environments?

The second research question sought to investigate differences in the learners' attitudes towards Spanish vocabulary learning after their learning experience with the web-based environments. The learners completed an attitudes scale before using the environments (pre-scale) and an attitudes scale after using the environments (post-scale). A Multiple Analysis of Covariance (MANCOVA) did not reveal any significant effect between the two groups (Wilks' Lambda = .835, $F = .788$, $p = .629$), suggesting that there were no significant differences between the two groups with respect to their attitudes towards Spanish vocabulary learning.

Research Question 3: Learning Experiences in the Web-based Environments

What are learners' experiences when learning Spanish vocabulary in the two web-based environments?

The third research question aimed at investigating learners' reactions and experiences with respect to using the web-based based environments in order to learn new vocabulary items. In order to elicit information about their learning experiences, the learners were asked to complete a questionnaire. This open-ended questionnaire asked learners to provide their opinion and reactions towards aspects of the environments that they liked or disliked, and that they considered to be most and least helpful, engaging,

helpful and effective. Analysis of the data through the constant comparative method gave rise to the following categories (discussed extensively in the previous chapter) with respect to the learners' experiences and reactions: learner performance (learners expressed overall satisfaction with the environments and desire to use them again or as part of the course); distinct learning styles and preferences (learners attributed likes and dislikes in terms of the environments to their learning style(s) or preference(s)); audiovisual preferences (learners showed overall preference for the audio component of the environments than the visual); and future implications for Spanish courses (learners suggested ways by which the environments could be improved).

Research Question 4: Learners' Use of the Pedagogical Agent

How do learners use a pedagogical agent when learning Spanish vocabulary?

The purpose of the fourth research question was to explore how the learners in the Experimental group used the animated pedagogical agent to improve their knowledge of the new lexical items. In order to maintain a robust experimental design, this conversational component was added to the environment after the delayed post-test was completed by the two groups. The objective of this exploratory part was to provide information as to how learners chose to use the pedagogical agent to improve their lexical knowledge. Such information can provide recommendations as to what knowledge pedagogical agents used in similar contexts should have so as to be beneficial for the learners. The chat scripts were saved and analyzed through content analysis in an attempt to identify some common themes that describe learners' behavior with and use of the agent. The following themes (discussed extensively in the previous chapter) emerged from the data analysis: vocabulary in context (learners incorporated the lexical items in

their conversation); definitions (learners asked for additional ways by which the lexical items could be defined); characteristics of the vocabulary (learners inquired information about the linguistic structure of the lexical items); vocabulary learning strategies (learners asked the agent for recommendations with respect to learning and remembering the vocabulary); personal questions (learners were interested in learning more information about the agent herself).

The short open-ended questionnaire completed by learners after their chat experience with Laura highlighted both positive and negative aspects of the conversational component. Positive comments included appreciation of her interactive aspect, enjoyment of the innovation behind this feature, as well as personal accomplishment and satisfaction for maintaining a conversation with someone perceived as being more proficient in the language. Negative comments included frustration with accent marks that needed to be included for comprehension to be achieved by the agent, and more prominently, frustration with the limited knowledge the agent depicted. As this part of the study was exploratory and the knowledge base of the agent was a work in progress at the time, these negative aspects were anticipated.

The findings of this study can contribute to the body of literature on pedagogical agents and their effect, as well as how they can be improved so as to be used successfully in some fields. A holistic discussion of the findings is presented in the following section.

DISCUSSION

The effects of incorporating pedagogical agents in web-based or computer-based learning environments have been investigated in different content areas, such as botanical anatomy (Lester et al., 1997; Moreno, Mayer, Spires, & Lester, 2001), computer literacy (Graesser et al., 1999), economics (Baylor & Ryu, 2003), electronic portfolio

development (Veletsianos & Yerasimou, 2005), engineering thermodynamics (Forbus & Kuehne, 1998), geography (Doering & Veletsianos, 2007), mathematics (Baylor, Shen, & Warren, 2004) and nanotechnology (Hershey-Dirkin, Mishra, & Altermatt, 2005). In addition, a few studies have investigated the effects of pedagogical agents in second/foreign language learning; however the majority has focused on English language learning (Choi & Clark, 2006; Massaro, 2004; Massaro & Light, 2003; Prendinger & Ishizuka, 2001). This study is one of the first to examine the role of a pedagogical agent in Spanish language learning, and specifically in vocabulary learning.

It has been the objective of multiple studies to investigate the impact of pedagogical agents on learning outcomes and on affective outcomes, such as interest and motivation. After all, as educators we feel the need to know what tools and what pedagogical methods yield the most successful results, especially when new and innovative tools are introduced which could stimulate students even more. As a result, there has been much investment in literature in unveiling whether pedagogical agents can have a positive impact on learning. Up to this point however, the evidence regarding any learning and affective benefits that pedagogical agents can offer to learning contexts has been varied and the results have been contradictory (Clark & Choi, 2005; Dehn & van Mulken, 2000; Gulz, 2004).

In this study it was hypothesized that the Experimental group would exhibit higher learning outcomes with respect to vocabulary recall and retention over the Control group. In addition, it was hypothesized that after using the web-based environments there would be significant differences in the attitudes of the two groups towards Spanish vocabulary learning, with the Experimental group demonstrating more interest, enjoyment, motivation and confidence than the Control group. The results of the study however did not prove these hypotheses. The presence of the pedagogical agent in the

web-based environment used by the Experimental group did not yield any significant differences in learning outcomes or attitudes between the two groups.

This finding is not uncommon in previous studies that investigated the effects of pedagogical agents on learning. Based on research studies that have been conducted, it is inconclusive as to whether pedagogical agent image and/or animation is required to create a viable pedagogical agent persona (Baylor & Ryu, 2003). Some studies (e.g. Atkinson, 2002) that claim that there are significant differences in learning outcomes in environments that incorporate a pedagogical agent, fail to isolate the variable of image from other features in the environment. It cannot therefore be concluded which technology feature(s) contributed to the learning outcomes in those specific settings. Furthermore, studies looking at the effects of pedagogical agents on learning outcomes sometimes do not differentiate between purely learning and affective outcomes. Also many studies just rely on self-reflection of the participants for the affective part.

This study controlled for both of these design flaws, as the two environments had the exact same features except for the presence of the agent in the environment of the Experimental group. The Control group received the audio of the agent and the exact same information on the website, except for the image of the animated agent. Given that some previous studies have yielded inconsistent results with respect to the impact of the presence of the pedagogical agent, it was the aim of this study to isolate it so as to see what its effects might be on learning. In addition, this study aimed at differentiating between and looking at learning outcomes as one point and attitudes or affective outcomes as a different point. This was achieved by administering different tests for each of these two variables; pre- and post- vocabulary tests to measure learning outcomes and pre- and post- attitudes scales to measure affective outcomes. Based on previous research on the social roles employed by learners when interacting with computers (Mayer, Sobko,

& Mautone, 2003; Moreno, Mayer, Spires, & Lester, 2001; Nass & Moon, 2000; Reeves & Nass, 1996), it was hypothesized that the presence of the agent (in image and animation) would lead the learner to perceive the agent as more human-like and therefore form a social relationship with her.

Reeves and Nass (1996) propose that people interpret computers as social partners, a proposition which forms the basis for their “media equation”; because of a human tendency to confuse what is real with what is perceived to be real, people automatically use social rules to guide their actions with these media. Therefore, by following appropriate social cues in multimedia learning, the learner can hold a social conversation with the computer, simulating human-to-human interaction.

Furthermore, the “social agency theory” (Mayer, Sobko, & Mautone, 2003; Moreno, Mayer, Spires, & Lester, 2001) supports that multimedia learning environments can be designed to encourage learners to operate under the assumption that their relationship with the computer is a social one, in which the conventions of human-to-human communication apply. This theory posits that the use of verbal and visual social cues in computer-based environments can foster the development of a partnership by encouraging the learners to consider their interaction with the computer to be similar to what they would expect from a human-to-human conversation. Priming the social interaction schema will cause the learner to try to understand and deeply process the computer’s instructional message concerning academic subject matter.

Even though it was hypothesized that this kind of social relationship would be built between the learners of the Experimental group and Laura, thus leading to increased learning outcomes and stronger positive attitudes than the Control group, this was not the case. These results could be attributed to different possible reasons. First, I believe that the time a learner spends with the pedagogical agent is a crucial factor in the

development of any type of social relationship. This holds true for human-to-human communication, social norms and foundation of social relationships as well. The more exposure to the agent and the more time spent with it, can help build a stronger social relationship between the learner and the agent.

Most of the studies in which the results claimed no significant effects caused by the presence of an agent involved one intervention, one session with the agent and overall a short amount of time spent with the agent. In an attempt to provide the learners with more time with the agent (Laura), this study involved one orientation session of 50 minutes and two learning sessions of 50 minutes. Due to the constraints of the curriculum in the specific course, it was not possible to allow for any more training sessions. It could be the case that this total amount of time was still insufficient in order for a social relationship to be established between the learners and Laura. Two of the studies that have found significant differences in learning outcomes when a pedagogical agent was employed, involved longer periods of time with the agent. In the studies of both Bosseler and Massaro (2003) and Lester et al. (1997), the learning period was over a long period of time, and involved repeated intervals on a regular basis and multiple exposures of the learners to the agent. This could be a possible factor contributing to the reason why both of these studies yielded significant learning outcomes caused by the pedagogical agents.

A second possible factor affecting the results obtained in this study might be the effect of the audio and the strength of the auditory cues present. Nass & Streuer (1993) found that very small cues, such as a human-like voice in the computer, can trigger social rules to be applied during the interaction of the learner with the computer. It might therefore be the case that given how human-like the audio was in both web-based environments, it sufficed to get the learners' attention and initiate a social interaction with the environments in both groups. As a result, the addition of the agent image was

redundant because the auditory cue was already strong and social enough. This could also explain the overall preference to the audio over the visual material of the environment, as expressed by the learners of both groups on the open-ended learning experiences questionnaire. Mayer, Dow and Mayer (2003) found that no significant differences were caused by the presence of the pedagogical agent (the “presence effect” as they referred to it), because the information was relayed so well through the audio that it did not matter whether the agent was there or not. The same was true in the study conducted by Craig, Gholson and Driscoll (2002), which found that the presence of the agent did not have any effects when compared to the audio-only group.

Moreno, Mayer and Lester (2000) also concluded that the image of the agent (the “image effect” as they called it) did not cause any significant differences, because the auditory cues were already very strong that the visual representation and expression of the pedagogical agent did not have any significant effects on the learning outcome. As Craig, Gholson and Driscoll (2002) and Moreno, Mayer, Spires and Lester (2001) suggested, when a good spoken narration is available on the environment, the presence of the agent does not seem to have an impact.

A third possible factor that could have contributed to why the results in this study did not support the hypotheses might be the actual content and the task at hand. Clark and Choi (2005) present a set of design principles and guidelines that should be followed in studies involving pedagogical agents, so as to increase the utility of such studies. The first principle they discuss is called “The Balanced Separation Principle: Separate Pedagogical Agents from Pedagogical Methods” (p. 211). By this principle, they urge researchers to consider whether any differences in students learning outcomes are due to the pedagogical agent or due to the pedagogical method provided/employed by the agent. In the case of this study, it could be the case that the definition and example sentence

provided by Laura for each lexical item was all that the learners needed to learn the vocabulary, and since these were available in audio and text on the window for each of the lexical items, the presence of Laura providing this information did not contribute any additional pedagogical benefit.

The authors also advise researchers to assess whether there are less expensive options or alternative ways by which the same instruction can be delivered with similar learning and motivation effects. They raise the question “Is the animated pedagogical agent the only way to deliver these types of instructional methods in a computer-based environment?” (p. 214). This question might apply in the case of the present study and especially for vocabulary learning. It could be the case that for this specific context, having the information on the website presented as text and having a good quality audio of that same information is sufficient for learning new lexical items in the web-based environment.

Another consideration involving the material and the task at hand might also be the difficulty level. Moreno, Mayer, Spires and Lester (2001) claim that difficult tasks require more cognitive effort, so it is expected that a group of learners working with the pedagogical agent should outperform a group of learners without the presence of an agent, because the agent personalizes the task and helps the learners feel a positive personal relationship with the agent; this in turn promotes interest in the task and fosters constructivist learning (Bates, 1994; Lester et al., 1997). This is also consistent with interest theories of motivation (Dewey, 1913; Harp & Mayer, 1998; Renninger, Hidi, & Krapp, 1992). Therefore, in terms of this study it might be the case that the task was not challenging enough, for which reason the characteristics described above were not observed with respect to the Experimental group.

Even if there were no significant differences in the learning and affective outcomes between the two groups in this study, it is important to emphasize that both groups exhibited vocabulary learning at the immediate post-test stage, as well as substantial retention of the new lexical items at the delayed post-test stage. Therefore, even if the presence of the pedagogical agent in the web-based environment of the Experimental group was not significantly beneficial as was hypothesized, it does not mean that it was harmful. On the contrary, learning was achieved in both groups.

These findings reject the notion proposed by some researchers that pedagogical agents can cause cognitive overload in the learners and as a result lead to decreased learning outcomes. Cognitive load theory suggests that “effective instructional materials facilitate learning by directing cognitive resources towards activities that are relevant to learning rather than toward preliminaries to learning” (Chandler & Sweller, 1991, p. 293). According to the cognitive load theory (Kalyuga, Chandler, & Sweller, 1999), the mere presence of an animated pedagogical agent can be detrimental to learning by dividing a learner’s limited cognitive resources into different visual segments. More specifically, this theory predicts that when an animated agent is present simultaneously with other visual information, learners need to split their attention between the two sources and this ends up being harmful to learning.

The fact that there were no significant differences in the learning outcomes of the two groups in this study, and the observed mean scores on the post-tests of the Experimental group indicate that the presence of the agent did not cause split-attention effect. The presence of the agent did not enhance performance, but it did not cause any split-attention effect either. This conclusion agrees with other studies that have found similar results with respect to the presence of the pedagogical agent (André, Rist, & Müller, 1999; Clarebout & Elen, 2007; Craig, Gholson, & Driscoll, 2002).

While the quantitative data collected aimed at investigating the effects of the pedagogical agent on vocabulary recall and retention as well as attitudes towards Spanish vocabulary learning, the qualitative data collected aimed at focusing more on the learners' preferences, reactions and experiences towards the environments as well as their use of the agent. It is interesting to note that even if analysis of the quantitative data of this study did not yield any significant differences, learners had various positive and encouraging comments to report both with respect to the web-based environments and with the pedagogical agent.

Specifically, when asked whether they would use the environments again or would like to have them as part of the regular course, 83.3% of the participants in the Control group and 95.7% of the participants in the Experimental group stated that they would. This indicates that the learners were satisfied with the material presented and the format of the environments. There were of course features that they indicated as problematic, but even so, the majority of them would be interested in having the environments as part of the course. This indication of interest from the learners is important, because as interest theories of motivation propose, learners work harder to make sense of material presented and as a result learn more deeply when they are personally interested in the material. It could be the case that learners in this study either did not have enough time with the material so as to increase their interest even more, or the material was not challenging enough for them.

The issue of time, discussed above extensively, was also raised by some learners in the learning experience questionnaire, as they expressed that they would have liked to have more time available to work with the environments. This was an important observation, since the use of pedagogical agents that I propose is as learning companions at home, helping learners with various issues of the Spanish language in context with the

curriculum and the material covered in the classroom. At home, learners can have the availability of time to work with the agent and gradually form a social relationship with her, perceiving her more as a learning tutor or companion able to help them improve their linguistic knowledge and language skills.

A significant part of whether learners liked the environments or not, or found them interesting and would like to work with them in the future, also involved individual learning styles and preferences. Many researchers in Second Language Acquisition have attributed differences in learning a new language to individual differences and distinct learning styles. Reid (1995) discusses sensory learning styles and describes five categories to explain perceptual learning styles: auditory, visual, tactile, kinesthetic, and haptic. It is always recommended that language educators and instructional designers respect such differences in learning styles and therefore implement activities that cater to all different learning styles. As observed in learners' responses on the questionnaire, their own perceptions of what their learning styles were affected their outlook on the environments themselves.

More pronounced in both groups were learners' audiovisual preferences. In both groups there seemed to be an overall preference and appreciation of the audio component embedded in the environments. This observation reinforces the argument discussed above with respect to audio; providing learners with audio narration of the information instead of text, helps learners focus more on the material presented. Including human-like voice in agent-based environments has also indicated positive effects in various studies. Furthermore, learners who study from visual presentations accompanied by audio narration of the information outperform learners with the same visual presentation accompanied by text (Mayer & Moreno, 1998; Moreno & Mayer, 1999; Moreno, Mayer, Spires, & Lester, 2001).

Presence of voice has motivational advantages, because it suggests social presence (Reeves & Nass, 1996). This can lead to an increase in learners' interest and agent interaction. It is optimal though to have a combination of the two – provide learners with both audio and the corresponding text, as was the case in the environments in this study – as this decreases cognitive overload and improves learning (Moreno & Mayer, 2000). This was observed in the learning experience questionnaire, in which some learners indicated that having the text and the audio of the definition and the example sentence was sufficient to them for learning the vocabulary items.

The reactions of the Experimental group towards the pedagogical agent expressed in the open-ended learning experience questionnaire were very useful in understanding the learners' perspective towards this new tool. The fact that a couple of learners commented that Laura was distracting because she was too animated (e.g. followed their cursor with her eyes and head) is in line with what Moreno, Mayer, Spires and Lester (2001) call the “interference hypothesis” (p. 185), which claims that sometimes the addition of an animated pedagogical agent to a web-based environment could be seen as extraneous and distracting to the learner. It is important to be aware of this issue and make appropriate decisions when designing pedagogical agents, especially in terms of how animated some of their features are.

It was also very interesting that some of the learners in the Experimental group gave suggestions as to how Laura could be improved and what other roles she could have (e.g. a tour guide) or what other material she could present (e.g. sociolinguistic information). As discussed above, Choi and Clark (2005) propose that the pedagogical agents should be separated from the pedagogical methods they provide and for them to be effective they need to be irreplaceable by alternative ways of providing instruction for the specific material. Taking this design principle and the learners' suggestions into account,

it could be argued that vocabulary learning might not be the most beneficial use of a pedagogical agent in a language learning environment, but some other areas (e.g. sociolinguistic and sociocultural aspects) might be more appropriate.

Addressing learner needs and investigating how the pedagogical agent could be more beneficial to them, was indeed the purpose of including the exploratory component in this study, which was completed at a second phase by the Experimental group. The purpose was to look at how learners use the agent and also what their reactions are to her. The themes that were identified from the analysis of the conversation scripts give feedback as to how much information the knowledge base of the agent should include. These results only reinforce the notion that it takes a very long time to build a knowledge base for the agent that includes everything and can address every possible question or comment from the learner. The fact that the knowledge of Laura would be limited and thus lead to some frustration was anticipated, as the knowledge base was a work in progress and was growing as learners asked their questions. The objective of this part of the study was to investigate what types of questions learners ask and what type of information they want to elicit from the agent so as to know what kind of knowledge to add to the agent.

As Doering, Veletsianos and Yerasimou (2008) discuss, frustration and sometimes anger from the part of the learner towards the agent is inevitable due to technological limitations that do not allow the agent to be as “intelligent” possible. At this point, technological limitations hinder researchers and scientists from creating perfect pedagogical agents that can “listen”, “perceive”, and “anticipate” user actions and be always ready to attend to learner needs (van Vuuren, 2007).

Baylor (2001) discusses the importance of agent control in an attempt to achieve, create or strengthen learner confidence. She describes four characteristics that the agent should have in order to inspire the learner to work with him/her:

1) Believable: the learner must perceive the agent as believable, not cartoonish, and the agent must have as human voice as possible. Nass & Streuer (1993) found that very small cues (such as a human-like voice in the computer) can trigger social rules to be applied during the interaction of the learner with the computer;

2) Motivational: the learner must be motivated by the agent through empathy or social cues that will strengthen the learner-agent relationship and will in fact resemble a human mentor in terms of motivational qualities. This motivational aspect helps engage the learner in the learning process and increases confidence;

3) Competent: the learner must perceive the agent as competent. In order for the learner to build confidence with the agent, the learner must perceive the agent as competent, sufficiently intelligent and efficient in the interactions and suggestions given. Norman (1997) in fact points out that people tend to have exaggerated expectations about what an agent can or should do, so interacting with an agent that they perceive as having sufficient intelligence and competence is important in building confidence and developing a social relationship with the agent;

4) Trustworthy: the learner must trust the agent in two ways – reassurance that everything is going well (technologically-wise), is under control and according to the plan and secondly, in terms of privacy of their interactions and confidentiality of their actions.

In this study, Laura was lacking competence, as her knowledge base was still in the process of being created and thus lacked a lot of information. This lack of competence was reflected during the chatting session between Laura and the learners and resulted in

frustration for some of the learners, who expressed that in the questionnaire. The positive aspect was that they also appreciated her interactive nature and character and expressed that they would work and chat with her again if she became more competent in the material.

LIMITATIONS

The results of this study should be interpreted cautiously and should be viewed within the context of the circumstances under which the study was conducted. While implementing this study I had to comply with what was realistically feasible to modify in the curriculum of the specific course so as to accommodate the study. I did not have at my disposal the resources to conduct a study with students from more sections of the same course, or over a longer period of time with more training sessions. Given the reality of the setting available to me, I tried to design the study in the best way possible so as to maximize the resources, but not affect the learners, or the course, or their performance in the course in a negative manner.

The size of the population could have affected the results of the study, as a bigger population of learners at the specific course level could have potentially yielded different results, specifically with respect to statistical significance.

The amount of time available for the learners to work with the environments is a limitation of the study. More training sessions and longer periods of time interacting with the agent could have lead to the creation of a social relationship between the learners and Laura and the development of social agency between them. That relationship in turn could have lead to higher learning and affective outcomes for the Experimental group.

The attitudes scales used could have been a limiting factor due to their design. If the pre- and post- attitude scales had been kept the same, or had included the same

amount of items the results could have been different, and the data collected from the scales could have been analyzed in a different statistical manner.

The limited knowledge base of the pedagogical agent was a limitation related to the exploratory component of the study, as it lead to frustration for some learners and lack of motivation to continue conversing with the agent. Even though the purpose of the exploratory component was to investigate what type of information the agent needs to have in her knowledge base in order to help the learners as much as possible, had she been able to maintain longer conversations with the learners, it would have lead to less frustration on the learners' part.

The content chosen for the study (vocabulary learning) could have been a limitation as well. The role of the agent could have been more pronounced in other content areas, which the learners considered harder or more difficult to study on their own than vocabulary learning, for which the pedagogical methods used by learners might be an alternative way of learning the material without the need of incorporating an agent.

Finally, another limitation of the study is the lack of triangulation of the qualitative data. In addition to the questionnaires completed, future research could take into account individual interviews of the participants or focus groups in which learners of the same group (control, experimental) share their learning experiences and reactions.

IMPLICATIONS

The results of this study add to the body of literature related to the use of pedagogical agents in web-based learning environments. Given that there are varied results in the literature at this point as to the impact and effects of pedagogical agents on learning outcomes and affective outcomes, this study adds to the body of research which has been steadily growing in the past few years.

The results also offer implications for instructional technology designers, language software designers, and finally educators. The proposal is to include a pedagogical agent in Spanish language software and student websites that accompany course textbooks, so that the agent can serve as a tutor or learning companion at home. The suggestion made in this study is not for the agent to be used as the main instructor, but to be used as a supplementary resource to support the learner through the language learning process. The uses and roles that some of the learners suggested for the agent on the questionnaire, indicate that they would want to have the agent as a companion at home, supporting them and providing encouragement along with information and help with respect to the course and the material.

In designing the agent as well as the web-based environment in which the learner presents the material, software designers and instructional technology designers should keep in mind the importance that learners place on individual learning styles and preferences. Since many learners attribute success and failure in learning the language or liking the environment to their learning style(s), designers should make sure to create environments that appeal to all different learning styles and provide activities from which all types of student will benefit. This idea is important to educators as well, who should incorporate different types of activities in their teaching so as to appeal to all the learners in the class.

As pointed out by learners, it is important to address the issue of accent marks in Spanish, since many times lack of an accent mark results in a different word. An interactive chart with all the accented letters and other special characters could be added to the website, so that the learners would only have to click on the chart in order to input one of the special characters.

It is of course essential that the pedagogical agent has a well-developed knowledge base, so as to address various questions regarding the material of the course as well as personal questions. For the learner to assign to the agent the role of tutor or learning companion, the learner must feel confident in the abilities and competence of the agent, otherwise the social relationship between the two cannot be built.

RECOMMENDATIONS FOR FUTURE RESEARCH

This study has provided several areas for future research, some of which are also related to the limitations of the study discussed above. First, a replication of the study can be completed with a larger population. In addition, a replication of the study needs to be completed over a longer period of time, involving multiple exposures of the learners to the web-based environments and more time spent with the pedagogical agent on a regular basis. Since what the study proposes is for the pedagogical agent to be used as a learning companion or tutor, the learners should have the freedom to use the agent outside of the classroom, and for long periods of time.

Since literature on pedagogical agents has focused on affective outcomes in addition to learning outcomes, it is important to carry out this study with a better attitudes scale that is most sensitive and clearly asks about learners' interest, motivation, confidence, efficacy, etc. with respect to the pedagogical agent. Affective outcomes cannot rely only on self-report as has been the case in some studies in the literature. An attitudes measure (both pre- and post-) that can be well-organized and appropriately analyzed needs to be used.

Related to attitudes and perspectives, another recommendation would be to give the learners some autonomy with respect to the choice of pedagogical agent. They could choose from a set of agents with different options such as male, female, with different

appearance, and with different Spanish-speaking accents. This would give the learners more control, and might also increase their interest towards the agent and the material, if their learning companion is someone that they could choose or modify.

With respect to the learners' relationship with the agent, an interesting area of research is to focus on the chat scripts from the chat sessions with Laura and analyze them rigorously through discourse analysis, focusing specifically on how the learners begin to form a social relationship - as described by the social agency theory (Mayer, Sobko, & Mautone, 2003; Moreno, Mayer, Spires, & Lester, 2001) - with the agent.

Another area of research is to focus on the demographic information collected from the learners and investigate whether any of the aspects included in the questionnaire (such as gender, age, use of technology for academic and entertainment purposes) has any impact in or correlation to the learning and affective outcomes of the study.

The content focus of this study was vocabulary learning and how it is affected by the use of a pedagogical agent. Since there has not been much research conducted on the use of pedagogical agents in Spanish language learning, it was important to conduct a narrower and focused study, which can then be used as a starting point for further research to be conducted in Spanish language learning. The study can be repeated with a focus on vocabulary learning, but with a richer context involved, since the learners might be more inclined to depend on the presence of the pedagogical agent for their learning progress, the more contextualized the vocabulary content becomes. Other content areas such as specific grammar points, cultural aspects, sociolinguistic and sociocultural aspects, could also be investigated. As a result, some conclusions could be drawn as to whether pedagogical agents can be more beneficial in some content areas in Spanish language learning than others.

Finally another recommendation would be to look at the difficulty level of the task at hand and include more difficult tasks that would require learners to transfer knowledge from the material presented in the environments. Moreno, Mayer, Spires and Lester (2001) suggest that problem-solving activities that involve transfer of the material presented require more cognitive effort than simpler tasks. It would be therefore interesting to investigate learning outcomes on different types of tasks classified by difficulty level, and examine whether pedagogical agents have greater impact for specific tasks than other. It would also be interesting to observe what the context of usage of the web-based environments and each of the activities is, so as to learn more about how the learners perceive the material on the environments and the content of the activities while they are involved with the information on the environments. This would enhance our understanding of what work more effectively in the learning process.

CONCLUSIONS

This study sought to investigate the effects of an animated pedagogical agent in Spanish vocabulary learning. In addition, the study aimed at examining how learners perceived and reacted to the pedagogical agent and how they chose to use the agent to improve their lexical knowledge.

Analysis of the quantitative data did not yield significant differences between the Control and the Experimental groups with respect to learning outcomes and affective outcomes. Analysis of the qualitative data revealed learners' preferences with respect to features embedded in the web-based language learning environments. In addition, it explored how learners utilized the conversational aspect of the pedagogical agent, and provided information as to the type of information the agent's knowledge base should include in order for the agent to be a beneficial tool for the learners' progress.

Research on the use of pedagogical agents in education is still at its early stages. It is not clear nor definite what types of domains could benefit most from pedagogical agents and in what form, or with what specific features (Clark & Choi, 2005). Especially in second/foreign language education there is an extremely small number of studies, with the majority of those focusing on English learning. It is important to carry out further investigation into more languages and more topics in language learning. Further research may contribute to a more informed decision as to whether pedagogical agents can provide benefits in second/foreign language education, and if so how. In addition, future research may tell us whether pedagogical agents are better suited for more science-related domains rather than language-related domains.

Appendix A: Web-based Environments

Web-based Environment: Control group, Day 1

La situación del mundo

En esta página web aprenderás y practicarás nuevo vocabulario sobre temas relacionados con la situación del mundo en el pasado, el presente y el futuro.

Parte I: ¡A Aprender!

Haz clic en cada una de las siguientes palabras para recibir más información.

1. la sequía	<i>drought</i>	11. polémico/a	<i>controversial</i>
2. el maremoto	<i>tidal wave (tsunami)</i>	12. inquietante	<i>disturbing</i>
3. el alud	<i>avalanche</i>	13. amenazante	<i>threatening</i>
4. el porvenir	<i>future</i>	14. disponible	<i>available</i>
5. la sobrepoblación	<i>overpopulation</i>	15. aportar	<i>to contribute</i>
6. el desafío	<i>challenge</i>	16. afrontar	<i>to confront</i>
7. la conciencia	<i>consciousness, awareness</i>	17. predecir	<i>to predict</i>
8. insalubre	<i>unhealthy</i>	18. adivinar	<i>to guess, to foretell</i>
9. provechoso/a	<i>helpful, beneficial</i>	19. enterarse (de)	<i>to become informed (about)</i>
10. comunitario/a	<i>communal</i>	20. llevar a cabo	<i>to carry out</i>

Parte II: ¡A Practicar!

Completa las siguientes actividades para practicar el nuevo vocabulario que has aprendido.

Haz clic aquí: [Actividades](#)

Web-based Environment: Experimental group, Day 1

La situación del mundo



En esta página web aprenderás y practicarás nuevo vocabulario sobre temas relacionados con la situación del mundo en el pasado, el presente y el futuro.

Parte I: ¡A Aprender!

Haz clic en cada una de las siguientes palabras para recibir más información.

- | | | | |
|--------------------------------------|---------------------------------|------------------------------------|-----------------------------------|
| 1. la sequía | <i>drought</i> | 11. polémico/a | <i>controversial</i> |
| 2. el maremoto | <i>tidal wave (tsunami)</i> | 12. inquietante | <i>disturbing</i> |
| 3. el alud | <i>avalanche</i> | 13. amenazante | <i>threatening</i> |
| 4. el porvenir | <i>future</i> | 14. disponible | <i>available</i> |
| 5. la sobrepoblación | <i>overpopulation</i> | 15. aportar | <i>to contribute</i> |
| 6. el desafío | <i>challenge</i> | 16. afrontar | <i>to confront</i> |
| 7. la conciencia | <i>consciousness, awareness</i> | 17. predecir | <i>to predict</i> |
| 8. insalubre | <i>unhealthy</i> | 18. adivinar | <i>to guess, to foretell</i> |
| 9. provechoso/a | <i>helpful, beneficial</i> | 19. enterarse (de) | <i>to become informed (about)</i> |
| 10. comunitario/a | <i>communal</i> | 20. llevar a cabo | <i>to carry out</i> |

Parte II: ¡A Practicar!

Completa las siguientes actividades para practicar el nuevo vocabulario que has aprendido.

Haz clic aquí: [Actividades](#)

Activities on the Web-based Environments: Day 1

Activity A: True - False

iA Practicar! – Actividades Exit this survey >>

2. Ejercicio A: iA Practicar! – ¿Cierto o Falso?

2 / 6

Lee las siguientes oraciones y decide si son ciertas o falsas. Si son falsas, corrégelas.

1. Es insalubre tener una vida relajada sin mucho estrés.

Cierto

Falso

¿Corrección?

2. Reciclar aluminio y plástico es una práctica provechosa para el planeta.

Cierto

Falso

¿Corrección?

3. Muchas organizaciones humanitarias evitan de crear conciencia de los problemas del mundo.

Cierto

Falso

¿Corrección?

4. Una persona optimista puede adivinar que en el futuro no habrá guerras en el mundo.

Cierto

Falso

¿Corrección?

5. El nivel de hambre entre los niños en algunos países es inquietante.

Cierto

Falso

¿Corrección?

6. Los aludes y las conciencias son desastres naturales.

Cierto

Falso

¿Corrección?

7. Un buen presidente debe poder enfrentar los desafíos que hay en su país.

Cierto

Falso

¿Corrección?

8. Es posible predecir que en el futuro todavía haya diferencias económicas y sociales entre diferentes países.

Cierto

Falso

¿Corrección?

9. Una sequía que dura muchos meses es beneficiosa para los bosques.

Cierto

Falso

¿Corrección?

10. La sobrepoblación es dañina para el planeta y el medio ambiente.

Cierto

Falso

¿Corrección?

<< Prev Next >>

Activity B: Fill-in the blanks, Multiple choice

iA Practicar! – Actividades Exit this survey >>

4. Ejercicio B. iA Practicar! – ¿Cuál es la opción correcta?

4 / 6

Escoge la MEJOR opción para completar cada oración.

1. _____ es un desastre natural.

- El porvenir
- El maremoto
- El desafío

2. Actualmente, el terrorismo es un tema _____ para muchos países.

- amenazante
- comunitario
- disponible

3. La clonación es un tema _____: a algunos médicos les interesan sus ventajas, pero a algunas personas más conservadoras les preocupan sus efectos en el mundo futuro.

- insalubre
- provechoso
- polémico

4. Cada año algunas compañías grandes _____ dinero para ayudar con investigaciones de medicina importantes.

- adivinan
- aportan
- afrontan

5. Es necesario _____ una fuerte campaña internacional contra la pobreza.

- predecir
- adivinar
- llevar a cabo

6. Si pudiéramos saber de hoy lo que nos traiga _____, podríamos prepararnos mejor para enfrentar esas situaciones en el futuro.

- el porvenir
- el desafío
- la conciencia

7. Si queremos saber lo que pasa en otros países, es importante _____ sus noticias usando un medio de la prensa internacional.

- enterarnos de
- aportar
- llevar a cabo

8. Tratar de eliminar la basura en las calles, es un servicio _____ que toda la gente debe hacer.

- insalubre
- comunal
- inquietante

9. Es importante que se _____ la pobreza y la desnutrición en África para bajar el número de personas que mueren cada año.

- lleven a cabo
- aporten
- afronten

10. En el Internet, hay mucha información _____ sobre los programas de ayuda que ofrecen varias organizaciones, como por ejemplo la Cruz Roja.

- amenazante
- insalubre
- disponible

<< Prev Next >>

Activity C: Productive task - Short-answer questions

6. Ejercicio C. iA Practicar! – ¡Opina!

6 / 6

Responde a las siguientes preguntas con oraciones completas. En cada respuesta usa por lo menos 3 palabras del nuevo vocabulario que has aprendido en la página web "La situación del mundo".

1. En tu opinión, ¿cuál es el desastre natural más peligroso? ¿Por qué? Da algunos ejemplos específicos para justificar tu opinión.

2. En tu opinión, ¿cuál es una situación o un problema preocupante del mundo moderno? Explica tu respuesta.

3. ¿Cuál es el problema social más grave que afronta tu país? ¿Qué puedes hacer para ayudar a eliminar este problema?

Web-based Environment: Control group, Day 2

La situación del mundo

En esta página web aprenderás y practicarás nuevo vocabulario sobre temas relacionados con la situación del mundo en el pasado, el presente y el futuro.

Parte I: ¡A Aprender!

Haz clic en cada una de las siguientes palabras para recibir más información.

- | | | | |
|--------------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 1. la novedad | <i>innovation</i> | 11. desafiante | <i>challenging</i> |
| 2. el avance | <i>advance, advancement</i> | 12. espantoso/a | <i>horrifying</i> |
| 3. la informática | <i>computer science</i> | 13. alucinante | <i>amazing, incredible</i> |
| 4. el teletrabajo | <i>telecommuting, teleworking</i> | 14. alcanzar | <i>to reach, to attain</i> |
| 5. el comercio justo | <i>fair trade</i> | 15. avisar | <i>to inform, to notify</i> |
| 6. el consumismo | <i>consumerism</i> | 16. enriquecer | <i>to enrich</i> |
| 7. la inversión | <i>investment</i> | 17. empeorar | <i>to worsen</i> |
| 8. asombroso/a | <i>astounding</i> | 18. brindar | <i>to offer</i> |
| 9. innovador(a) | <i>innovative</i> | 19. recaudar | <i>to raise (money / funds)</i> |
| 10. desilusionante | <i>disappointing</i> | 20. reemplazar | <i>to replace</i> |

Parte II: ¡A Practicar!

Completa las siguientes actividades para practicar el nuevo vocabulario que has aprendido.

Haz clic aquí: [Actividades](#)

Web-based Environment: Experimental group, Day 2

La situación del mundo



En esta página web aprenderás y practicarás nuevo vocabulario sobre temas relacionados con la situación del mundo en el pasado, el presente y el futuro.

Parte I: ¡A Aprender!

Haz clic en cada una de las siguientes palabras para recibir más información.

- | | | | |
|--------------------------------------|-----------------------------------|---------------------------------|---------------------------------|
| 1. la novedad | <i>innovation</i> | 11. desafiante | <i>challenging</i> |
| 2. el avance | <i>advance, advancement</i> | 12. espantoso/a | <i>horrifying</i> |
| 3. la informática | <i>computer science</i> | 13. alucinante | <i>amazing, incredible</i> |
| 4. el teletrabajo | <i>telecommuting, teleworking</i> | 14. alcanzar | <i>to reach, to attain</i> |
| 5. el comercio justo | <i>fair trade</i> | 15. avisar | <i>to inform, to notify</i> |
| 6. el consumismo | <i>consumerism</i> | 16. enriquecer | <i>to enrich</i> |
| 7. la inversión | <i>investment</i> | 17. empeorar | <i>to worsen</i> |
| 8. asombroso/a | <i>astonishing</i> | 18. brindar | <i>to offer</i> |
| 9. innovador(a) | <i>innovative</i> | 19. recaudar | <i>to raise (money / funds)</i> |
| 10. desilusionante | <i>disappointing</i> | 20. reemplazar | <i>to replace</i> |

Parte II: ¡A Practicar!

Completa las siguientes actividades para practicar el nuevo vocabulario que has aprendido.

Haz clic aquí: [Actividades](#)

Activities on the Web-based Environments: Day 2

Activity A: True - False

iA Practicar! – Actividades Exit this survey >>

2. Ejercicio A: iA Practicar! – ¿Cierto o Falso?

2 / 6

Lee las siguientes oraciones y decide si son ciertas o falsas. Si son falsas, corrígelas.

1. Es posible que haya más teletrabajos en el futuro.

Cierto
 Falso

¿Corrección?

2. El campo de la informática ha experimentado varios progresos durante los últimos años, a causa de los progresos tecnológicos que se notan en general en el mundo.

Cierto
 Falso

¿Corrección?

3. Es desilusionante cuando el gobierno de un país respeta los derechos humanos de sus ciudadanos.

Cierto
 Falso

¿Corrección?

4. Cuando un país exporta productos tecnológicos, su economía usualmente empeora.

Cierto
 Falso

¿Corrección?

5. Las novedades tecnológicas permiten que la gente se comunique más fácilmente con amigos y parientes.

Cierto
 Falso

¿Corrección?

6. Comprar productos del comercio justo es una práctica que hace daño a los pequeños agricultores.

Cierto
 Falso

¿Corrección?

7. El consumismo se observa usualmente en países menos prósperos que en países más desarrollados.

Cierto

Falso

¿Corrección?

8. Es posible que en el futuro los robots reemplacen a las personas en algunos trabajos que se pueden hacer automáticamente.

Cierto

Falso

¿Corrección?

9. El terrorismo es un problema espantoso para muchos países.

Cierto

Falso

¿Corrección?

10. Es alucinante que sepamos tanta información sobre el universo y los otros planetas.

Cierto

Falso

¿Corrección?

<< Prev Next >>

Activity B: Fill-in the blanks, Multiple choice

iA Practicar! – Actividades [Exit this survey >>](#)

4. Ejercicio B. iA Practicar! – ¿Cuál es la opción correcta?

4 / 6

Escoge la MEJOR opción para completar cada oración.

1. Cada día, los hombres de negocios deben ver los anuncios financieros en los periódicos o en el Internet, para saber los resultados de sus _____.

- teletrabajos
- inversiones
- novedades

2. Las exportaciones usualmente ayudan a _____ la economía de un país.

- enriquecer
- empeorar
- reemplazar

3. Usar coches híbridos es una práctica _____ que también ayuda al bienestar del planeta.

- desilusionante
- espantosa
- innovadora

4. Si un grupo necesita dinero para una causa, puede _____ fondos.

- avisar
- recaudar
- brindar

5. Mejorar la economía del país sin crear desigualdad entre la gente, es un asunto _____ para todos los presidentes de países democráticos.

- desafiante
- alucinante
- asombroso

6. _____ tecnológicos también contribuyen en el campo de medicina, ya que permiten que se descubran nuevas curas para varias enfermedades.

- Las inversiones
- Los teletrabajos
- Los avances

7. Es importante que un gobierno _____ programas de educación gratis a todos sus ciudadanos para que personas de clases más bajas tengan la oportunidad de educarse y desarrollarse.

- reemplace
- brinde
- alcance

8. Para _____ sus objetivos, las Naciones Unidas tienen reuniones frecuentes con los líderes de países que se enfrentan con conflictos nacionales o internacionales.

- alcanzar
- enriquecer
- recaudar

9. Es _____ cuánto ha avanzado la tecnología en respeto a los medios de comunicación durante la última década.

- desilusionante
- desafiante
- asombroso

10. Es necesario que un gobierno _____ a los ciudadanos de su país del estado y del progreso de la economía del país.

- alcance
- avise
- enriquezca

<< Prev Next >>

Activity C: Productive task - Short-answer questions

iA Practicar! – Actividades [Exit this survey >>](#)

6. Ejercicio C. iA Practicar! – ¡Opina!

6 / 6

Responde a las siguientes preguntas con oraciones completas. En CADA respuesta usa por lo menos 3 palabras del NUEVO vocabulario que has aprendido en la página web "La situación del mundo".

1. En tu opinión, ¿cómo se compara el estado actual de la economía de tu país al estado de la economía durante los años noventa? ¿Por qué crees eso? Explica tu respuesta.

2. Cuando piensas en los avances tecnológicos de los últimos años, ¿qué te gusta y qué te disgusta? ¿Por qué?

3. ¿Cómo imaginas que será la situación del mundo (específicamente en temas sociales, económicos y tecnológicos) en el futuro y por qué? Explica tu respuesta.

<< Prev Done >>

Appendix B: Demographic Information Questionnaire

Introduction: The purpose of this questionnaire is to collect some background information about you and your experience with using technology for educational or entertainment purposes. Your answers will remain completely confidential. Thank you very much for taking the time to complete this!

Your Name: _____

Please provide some demographic information about yourself by selecting the appropriate option:

1. Your Age: _____

3. Your Major at UT-Austin: _____

4. Your Current GPA:

_____ Less than 2.00

_____ 2.00 – 2.49

_____ 2.50 – 2.99

_____ 3.00 – 3.49

_____ 3.50 – 3.99

_____ 4.00

5. What are your primary reasons for taking this course (SPN 312L)? Please check all that apply:

_____ a) to fulfill the general language requirement

_____ b) to better communicate with my family

_____ c) to improve my bilingual skills for my current or future job(s)

_____ d) to improve my GPA

_____ e) to talk to my friends

_____ f) to listen to and/or watch Spanish language TV programs, films, music, and radio

_____ g) to read Spanish language newspapers, magazines, and books

_____ h) to feel closer to my culture

_____ i) other (please specify in the space below):

6. Please rate your overall skill with using technology in support of your academic practice, by checking one of the following:

- Non-user
- Novice
- Intermediate
- Advanced
- Expert: I often serve as a resource to others.

7. Have you ever used a pedagogical / intelligent agent or a virtual character for any educational or entertainment purposes? Please check one of the following:

- NO
- YES (Please use the space below to explain in what way)

8. Have you ever used any of the following web-based tools for any educational or entertainment purposes? Please check all that apply and indicate approximately how much time per week you spent on the specific tool:

- Internet website
- Internet search engine (e.g. Google, Yahoo, etc.)
- Internet / Online tutor
- Internet / Online help tools
- Online discussion list
- Online / Web-based course (any type of educational course)
- Online / Web-based language course
- Internet / Web-based language learning exercises/activities
- Online / Web-based game

9. For each of the web-based tools that you chose in the previous question (question #8), please indicate below approximately how much time per week you spent on the specific tool:

Internet website – Time per week:

Internet search engine (e.g. Google, Yahoo, etc.) – Time per week:

Internet / Online tutor – Time per week:

Internet / Online help tools – Time per week:

Online discussion list – Time per week:

Online / Web-based course (any type of educational course) – Time per week:

Online / Web-based language course – Time per week:

Internet / Web-based language learning exercises/activities – Time per week:

Online / Web-based game – Time per week:

Appendix C: Vocabulary Pre-test

Name: _____

In the following column you are provided with a list of words. Most probably you do not know and cannot recognize any of the words, but it is also possible that you already know some of them. Please mark (using X) the words that you believe you have learnt in the past, or the words that you already know. For those words that you mark with X, please also provide the English translation in the indicated space.

- | | | |
|---------------------|-------|--------------------|
| 1) alcanzar | _____ | Translation: _____ |
| 2) empeorar | _____ | Translation: _____ |
| 3) el consumismo | _____ | Translation: _____ |
| 4) avanzar | _____ | Translation: _____ |
| 5) el bienestar | _____ | Translation: _____ |
| 6) eliminar | _____ | Translation: _____ |
| 7) afrontar | _____ | Translation: _____ |
| 8) enriquecer | _____ | Translation: _____ |
| 9) brindar | _____ | Translation: _____ |
| 10) predecir | _____ | Translation: _____ |
| 11) la desigualdad | _____ | Translation: _____ |
| 12) recaudar | _____ | Translation: _____ |
| 13) el ciberespacio | _____ | Translation: _____ |
| 14) sobrevivir | _____ | Translation: _____ |
| 15) la frontera | _____ | Translation: _____ |
| 16) inquietante | _____ | Translation: _____ |
| 17) disponible | _____ | Translation: _____ |
| 18) asombroso/a | _____ | Translation: _____ |
| 19) la sequía | _____ | Translation: _____ |
| 20) inesperado/a | _____ | Translation: _____ |
| 21) pacífico/a | _____ | Translation: _____ |
| 22) curar | _____ | Translation: _____ |

- | | | | |
|-------------------------|-------|---------------------|-------|
| 23) el avance | _____ | Translation: | _____ |
| 24) el huracán | _____ | Translation: | _____ |
| 25) intrigante | _____ | Translation: | _____ |
| 26) la compasión | _____ | Translation: | _____ |
| 27) polémico/a | _____ | Translation: | _____ |
| 28) la realidad virtual | _____ | Translation: | _____ |
| 29) innovador(a) | _____ | Translation: | _____ |
| 30) comunitario/a | _____ | Translation: | _____ |
| 31) el bosque lluvioso | _____ | Translation: | _____ |
| 32) genético/a | _____ | Translation: | _____ |
| 33) el desafío | _____ | Translation: | _____ |
| 34) el teletrabajo | _____ | Translation: | _____ |
| 35) la empatía | _____ | Translation: | _____ |
| 36) aportar | _____ | Translation: | _____ |
| 37) desastroso/a | _____ | Translation: | _____ |
| 38) el crecimiento | _____ | Translation: | _____ |
| 39) el porvenir | _____ | Translation: | _____ |
| 40) el reciclaje | _____ | Translation: | _____ |
| 41) poderoso/a | _____ | Translation: | _____ |
| 42) la sobrepoblación | _____ | Translation: | _____ |
| 43) la inundación | _____ | Translation: | _____ |
| 44) el terremoto | _____ | Translation: | _____ |
| 45) provechoso/a | _____ | Translation: | _____ |
| 46) impactar | _____ | Translation: | _____ |
| 47) el desarrollo | _____ | Translation: | _____ |
| 48) inimaginable | _____ | Translation: | _____ |
| 49) la informática | _____ | Translation: | _____ |
| 50) humanitario/a | _____ | Translation: | _____ |
| 51) reemplazar | _____ | Translation: | _____ |
| 52) la brecha digital | _____ | Translation: | _____ |

- 53) inminente _____
- 54) la capacidad _____
- 55) adivinar _____
- 56) el comercio justo _____
- 57) amenazante _____
- 58) insalubre _____
- 59) el maremoto _____
- 60) la conciencia _____
- 61) ingenioso/a _____
- 62) preguntarse _____
- 63) la contaminación _____
- 64) la novedad _____
- 65) sostenible _____

- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____
- Translation:** _____

Appendix D: Vocabulary Post-tests

Immediate Post-test: Day 1

Parte III: ¡A Evaluar!

Name: _____

This is a vocabulary assessment. Below you are provided with different sets of words and definitions. In each set, there are six words and three definitions. Please choose the right word of the six, which best goes with each definition, by writing the corresponding number next to the definition. There is only ONE correct word for each definition.

1. afrontar
 2. aportar _____ informarse de algo
 3. llevar a cabo _____ enfrentar un peligro, enemigo o una situación
 4. enterarse de _____ anunciar de antemano algo que pasará en el futuro
 5. atraer
 6. predecir
-

1. el alud
 2. la sequía _____ el conocimiento reflexivo de las cosas
 3. el desafío _____ lo que pasa cuando no llueve por mucho tiempo
 4. el porvenir _____ gran masa de nieve que se derrumba de las
 5. la conciencia _____ montañas
 6. la sobrepoblación
-

1. comunitario
 2. polémico _____ cuando algo es beneficioso o útil
 3. insalubre _____ cuando algo no es bueno para la salud
 4. inquietante _____ cuando algo causa preocupación
 5. provechoso
 6. disponible
-

1. enterarse de
 2. adivinar _____ ejecutar, completar o concluir algo
 3. afrontar _____ contribuir con algo
 4. atraer _____ tratar de descubrir o predecir algo por casualidad
 5. llevar a cabo
 6. aportar
-

1. la sequía
 2. el porvenir _____ el exceso de personas en un país
 3. la sobrepoblación _____ una turbulencia violenta del agua del mar
 4. el alud _____ la acción de enfrentarse a situaciones difíciles
 5. el maremoto _____ con decisión
 6. el desafío
-

1. polémico
2. inquietante _____ cuando algo está listo para usarse
3. disponible _____ cuando algo es controversial
4. provechoso _____ cuando algo pertenece o se relaciona a la
5. comunitario _____ comunidad
6. amenazante

1. la conciencia

2. el porvenir _____ revelar de antes algo que pasará en el futuro

3. amenazante _____ un suceso o un tiempo futuro

4. provechoso _____ cuando algo causa mal a alguien

5. enterarse de

6. predecir

Immediate post-test: Day 2

Parte III: ¡A Evaluar!

Name: _____

This is a vocabulary assessment. Below you are provided with different sets of words and definitions. In each set, there are six words and three definitions. Please choose the right word of the six, which best goes with each definition, by writing the corresponding number next to the definition. There is only ONE correct word for each definition.

1. empeorar
2. brindar _____ dar noticia o información de algo
3. avisar _____ llegar a tener o poseer algo que una persona busca
4. reemplazar _____ hacer rica o más grande a una persona, cultura,
5. alcanzar _____ nación
6. enriquecer

-
1. el teletrabajo _____ la tendencia de gastar bienes que no son siempre
 2. la inversión _____ necesarios
 3. la novedad _____ cosa nueva o algo que es nuevo
 4. el consumismo _____ el estudio del tratamiento de información por
 5. la informática _____ computadoras
 6. el comercio justo

-
1. innovador
 2. desilusionante _____ cuando algo es fantástico o increíble
 3. asombroso _____ cuando algo introduce algo totalmente nuevo
 4. espantoso _____ cuando algo hace perder la esperanza sobre una
 5. desafiante _____ situación
 6. alucinante

1. recaudar
 2. enriquecer _____ ofrecer algo a alguien
 3. empeorar _____ recoger o acumular dinero / fondos
 4. reemplazar _____ lo opuesto de mejorar
 5. brindar
 6. alcanzar
-

1. el consumismo
 2. el comercio justo _____ el acto de poner dinero o energía en una empresa
 3. el teletrabajo _____ la acción de mover hacia adelante
 4. la informática _____ comprar productos que dan más ganancia a los productores
 5. la inversión
 6. el avance
-

1. desafiante
 2. alucinante _____ cuando algo causa horror
 3. innovador _____ cuando algo causa gran admiración
 4. asombroso _____ cuando algo hace enfrentarse a las dificultades con decisión
 5. espantoso
 6. desilusionante
-

1. el teletrabajo
2. el consumismo _____ cuando algo introduce algo totalmente nuevo
3. innovador _____ sustituir algo o alguien por otra cosa
4. desilusionante _____ usar redes de telecomunicación para trabajar de afuera
5. reemplazar
6. alcanzar

Delayed Post-test

¡A Evaluar!

Name: _____

This is a vocabulary assessment. Below you are provided with different sets of words and definitions. In each set, there are six words and three definitions. Please choose the right word of the six, which best goes with each definition, by writing the corresponding number next to the definition. There is only ONE correct word for each definition.

1. avisar
2. empeorar _____ dar noticia o información de algo
3. brindar _____ llegar a tener o poseer algo que una persona busca
4. reemplazar _____ hacer rica o más grande a una persona, cultura,
5. enriquecer _____ nación
6. alcanzar

-
1. la conciencia
 2. el porvenir _____ el conocimiento reflexivo de las cosas
 3. el desafío _____ lo que pasa cuando no llueve por mucho tiempo
 4. la sequía _____ gran masa de nieve que se derrumba de las
 5. el alud _____ montañas
 6. la sobrepoblación

-
1. desilusionante
 2. innovador _____ cuando algo es fantástico o increíble
 3. desafiante _____ cuando algo introduce algo totalmente nuevo
 4. espantoso _____ cuando algo hace perder la esperanza sobre una
 5. asombroso _____ situación
 6. alucinante

1. llevar a cabo
2. adivinar _____ ejecutar, completar o concluir algo
3. afrontar _____ contribuir con algo
4. aportar _____ tratar de descubrir o predecir algo por casualidad
5. enterarse de
6. atraer

-
1. el avance
 2. el comercio justo _____ el acto de poner dinero o energía en una empresa
 3. la inversión _____ la acción de mover hacia adelante
 4. la informática _____ comprar productos que dan más ganancia a los productores
 5. el teletrabajo
 6. el consumismo

-
1. espantoso
 2. desilusionante _____ cuando algo causa horror
 3. innovador _____ cuando algo causa gran admiración
 4. asombroso _____ cuando algo hace enfrentarse a las dificultades con decisión
 5. desafiante
 6. alucinante

-
1. provechoso
 2. amenazante _____ revelar de antes algo que pasará en el futuro
 3. el porvenir _____ un suceso o un tiempo futuro
 4. la conciencia _____ cuando algo causa mal a alguien
 5. predecir
 6. enterarse de

1. aportar
2. afrontar _____ informarse de algo
3. llevar a cabo _____ enfrentar un peligro, enemigo o una situación
4. enterarse de _____ anunciar de antemano algo que pasará en el futuro
5. atraer
6. predecir

-
1. el consumismo _____ la tendencia de gastar bienes que no son siempre necesarios
 2. la novedad _____
 3. la inversión _____ cosa nueva o algo que es nuevo
 4. el teletrabajo _____ el estudio del tratamiento de información por computadoras
 5. la informática _____
 6. el comercio justo _____

-
1. comunitario
 2. polémico _____ cuando algo es beneficioso o útil
 3. inquietante _____ cuando algo no es bueno para la salud
 4. insalubre _____ cuando algo causa preocupación
 5. disponible
 6. provechoso

-
1. enriquecer
 2. recaudar _____ ofrecer algo a alguien
 3. brindar _____ recoger o acumular dinero / fondos
 4. reemplazar _____ lo opuesto de mejorar
 5. empeorar
 6. alcanzar
-

1. la sequía
2. el maremoto _____ el exceso de personas en un país
3. el alud _____ una turbulencia violenta del agua del mar
4. la sobrepoblación _____ la acción de enfrentarse a situaciones difíciles
con decisión
5. el porvenir
6. el desafío

-
1. provechoso
 2. comunitario _____ cuando algo está listo para usarse
 3. amenazante _____ cuando algo es controversial
 4. polémico _____ cuando algo pertenece o se relaciona a la
comunidad
 5. inquietante
 6. disponible

-
1. alcanzar
 2. reemplazar _____ cuando algo introduce algo totalmente nuevo
 3. desilusionante _____ sustituir algo o alguien por otra cosa
 4. innovador _____ usar redes de telecomunicación para trabajar de
afuera
 5. el consumismo
 6. el teletrabajo

Appendix E: Attitudes scales

Pre-scale: Both groups

Name: _____

The following statements are about your general attitudes, impressions, and feelings when it comes to learning new vocabulary in Spanish. Please answer truthfully by indicating the scale to which each statement generally applies to you (ranging from “Strongly disagree” to “Strongly agree”).

There is no right or wrong answer. Above all, the statement that you choose will not be a reflection of your performance in this class, nor will it affect your grade or how you are perceived in this class. Therefore, please answer honestly and indicate which statement best applies to you when it comes to learning new Spanish vocabulary in general.

Respond to the following statements indicating with a check mark (✓) the strength of your agreement or disagreement with the statement. Please note that there is no right or wrong response.					
1 = Strongly Disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree	SD 1	D 2	N 3	A 4	SA 5
I am interested in learning new vocabulary in Spanish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I enjoy learning new vocabulary in Spanish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am motivated to learn new vocabulary in Spanish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I feel confident in using new vocabulary in Spanish.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Post-scale: Control group

Name: _____

The following statements are about your attitudes, impressions, and feelings related to the web-based environment “La situación del mundo” that you have used to learn new vocabulary. Please answer truthfully by indicating the scale to which each statement generally applies to you (ranging from “Strongly Disagree” to “Strongly Agree”).

There is no right or wrong answer. Above all, the statement that you choose will not be a reflection of your performance in this class, nor will it affect your grade or how you are perceived in this class.

Respond to the following statements indicating with a check mark (✓) the strength of your agreement or disagreement with the statement. Please note that there is no right or wrong response.					
1 = Strongly Disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree	SD 1	D 2	N 3	A 4	SA 5
The material presented in this web-based environment was interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I enjoyed using the material presented in this web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was interested while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was attentive while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was absorbed while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was motivated to continue working with the material presented in the web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
This web-based environment increased my interest in Spanish vocabulary learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I am confident in using the Spanish vocabulary presented in this web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I had a chance to use this web-based environment again, I would be eager to do so.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Post-scale: Experimental group

Name: _____

The following statements are about your attitudes, impressions, and feelings related to the web-based environment “La situación del mundo” that you have used to learn new vocabulary. Please answer truthfully by indicating the scale to which each statement generally applies to you (ranging from “Strongly Disagree” to “Strongly Agree”).

There is no right or wrong answer. Above all, the statement that you choose will not be a reflection of your performance in this class, nor will it affect your grade or how you are perceived in this class.

Respond to the following statements indicating with a check mark (✓) the strength of your agreement or disagreement with the statement. Please note that there is no right or wrong response.					
1 = Strongly Disagree, 2= Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree	SD 1	D 2	N 3	A 4	SA 5
The material presented by Laura in this web-based environment was interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I enjoyed using the material presented by Laura in this web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was interested while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was attentive while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was absorbed while learning the vocabulary and completing the activities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I was motivated to continue working with the material presented by Laura in this web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laura and this web-based environment increased my interest in Spanish vocabulary learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I am confident in using the Spanish vocabulary presented by Laura in this web-based environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If I had a chance to use Laura and this web-based environment again, I would be eager to do so.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix F: Learning Experience Questionnaire

Control group

Name: _____

Introduction: This questionnaire is about your experience using the web-based environment “La situación del mundo” to learn Spanish vocabulary. Your answers and comments are greatly appreciated, as they will be used to improve a language learning tool. There is no right or wrong answer. On the contrary, you are encouraged to include any negative comments you might have. Be assured that your answers will not be a reflection of your performance in this class, nor will they affect your grade or how you are perceived in this class.

1. What did you like best about the web-based environment and why? (You can discuss anything you wish about the environment - the design, the format, the content and the material, etc.)

2. What would you change about the web-based environment and why? (You can discuss anything you wish about the environment - the design, the format, the content and the material, etc.)

3. What were the most and least engaging aspects of the web-based environment and why?

Most engaging:

Least engaging:

4. What were the most and least helpful aspects of the web-based environment and why?

Most helpful:

Least helpful:

5. How did you feel about using this environment to learn Spanish vocabulary? Did you find it effective? Please explain your answer.

6. If such a web-based environment were available to you in this Spanish course (e.g. for each chapter of the textbook), would you use it? Please explain your answer.

Please add below any other comments (positive or negative) you might have that will help in improving this learning tool.

Experimental group

Name: _____

Introduction: This questionnaire is about your experience using the web-based environment “La situación del mundo” to learn Spanish vocabulary. Your answers and comments are greatly appreciated, as they will be used to improve a language learning tool. There is no right or wrong answer. On the contrary, you are encouraged to include any negative comments you might have. Be assured that your answers will not be a reflection of your performance in this class, nor will they affect your grade or how you are perceived in this class.

1. What did you like best about the web-based environment and why? (You can discuss anything you wish about the environment - the design, the format, the content and the material, etc.)

2. What would you change about the web-based environment and why? (You can discuss anything you wish about the environment - the design, the format, the content and the material, etc.)

3. What were the most and least engaging aspects of the web-based environment and why?

Most engaging:

Least engaging:

4. What were the most and least helpful aspects of the web-based environment and why?

Most helpful:

Least helpful:

5. How did you feel about using this web-based environment to learn Spanish vocabulary? Did you find it effective? Please explain your answer.

6. How did you feel about having Laura present in the environment while you were learning the vocabulary? Did you find her helpful or effective in your learning process? Please explain your answer.

7. If such a web-based environment were available to you in this Spanish course (e.g. for each chapter of the textbook), would you use it? Please explain your answer.

Please add below any other comments (positive or negative) you might have that will help in improving this learning tool.

Appendix G: Consent form

IRB APPROVED ON: 01/09/2008

EXPIRES ON: 01/07/2009

IRB PROTOCOL # 2006-07-0003

Consent to Participate in Research

Title:

Spanish Lexical Acquisition in Two Web-based Environments: An Analysis of the Effects of Incorporating a Pedagogical Agent

Conducted By:

Katerina Theodoridou, Department of Foreign Language Education, The University of Texas at Austin. Contact information: (512) 576-7122; rina.th@mail.utexas.edu

Faculty Sponsor: Professor Zsuzsanna Abrams, Department of Germanic Studies, The University of Texas at Austin. Contact information: (512) 232-6374; zsabrams@mail.utexas.edu

Funding source: This study is not funded.

You are being asked to participate in a research study. This form provides you with information about the study. The person in charge of this research will also describe this study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to take part. Your participation is entirely voluntary. You can refuse to participate without penalty or loss of benefits to which you are otherwise entitled. You can stop your participation at any time and your refusal will not impact current or future relationships with UT Austin or participating sites. To do so simply tell the researcher you wish to stop participation. The researcher will provide you with a copy of this consent for your records.

The purpose of this study is to investigate how students learn Spanish vocabulary in a web-based environment and the effects of different pedagogical tools embedded in the environment on Spanish lexical acquisition and on students' attitudes towards Spanish vocabulary learning. In addition, this study intends to explore how students use specific pedagogical tools in the environment and what their experiences are when learning vocabulary in the specific web-based environment. Fifty students from fourth-semester Spanish classes will be asked to participate in this study.

If you agree to be in this study, we will ask you to do the following things:

- Sign this consent form indicating that you agree to participate in the study.
- Allow us to keep copies of some of the assignments that you complete as part of the course. These assignments will be related to the Spanish vocabulary you learn

- when using the web-based environment. You will complete these specific assignments when your class meets in the language computer lab in order to learn and practice Spanish vocabulary.
- Complete a survey and a questionnaire about your vocabulary learning perceptions and your experiences when learning vocabulary in the web-based environment.

Total estimated time to participate in study is a maximum of 4 hours (3 50-minute class periods, about 30 minutes at home to complete the questionnaire and 15 minutes in class for a delayed test.) Whether you agree to participate in the study or not, you are still required to complete the assignments in the computer lab and at home as part of one of the grade components for the course.

Risks of being in the study

- The risk associated with this study is minimal and no greater than everyday life. There are no physical, psychological, or emotional risks associated with this study.

Benefits of being in the study

- You will gain the benefit of contributing to the knowledge in the area of educational research, as well as having input in the way pedagogical tools in a web-based environment can be used to enhance and stimulate language learning.

Compensation:

- There is no compensation for participating in this study.

Confidentiality and Privacy Protections:

- The Faculty Sponsor will collect and keep the consent form until course grades have been assigned. Only then will she provide the researcher (the instructor of the course) with this information. Your instructor, who gives you the grade for the course, will not know whether you chose to participate in this study or not until after course grades have been submitted. Therefore your decision will in no way negatively affect your grade.
- The assignments collected which contain your name, will be coded by the Faculty Sponsor and your name will be removed. Therefore the data will be anonymous and there will be no identifying information on it which links it back to you. The researcher (the instructor of the course) will not receive this data until after course grades have been assigned.
- The survey and questionnaire about your vocabulary learning perceptions and experiences using the web-based environment are anonymous and there is no identifying information on them linking the comments back to you.
- All data will be kept confidential at all times. All data on paper will be locked in a secure place, and all computer files will be kept on a password-protected computer.

- The data resulting from your participation may be made available to other researchers in the future for research purposes not detailed within this consent form. In these cases, the data will contain no identifying information that could associate you with it, or with your participation in any study.

The records of this study will be stored securely and kept confidential. Authorized persons from The University of Texas at Austin and members of the Institutional Review Board have the legal right to review your research records and will protect the confidentiality of those records to the extent permitted by law. All publications will exclude any information that will make it possible to identify you as a subject. Throughout the study, the researchers will notify you of new information that may become available and that might affect your decision to remain in the study.

Contacts and Questions:

If you have any questions about the study please ask now. If you have questions later or want additional information, please contact Katerina Theodoridou at (512) 576-7122 or rina.th@mail.utexas.edu. If you wish to withdraw your participation, please contact Professor Zsuzsanna Abrams at (512) 232-6374 or zsabrams@mail.utexas.edu

If you have questions about your rights as a research participant, complaints, concerns, or questions about the research please contact Jody Jensen, Ph.D., Chair, The University of Texas at Austin Institutional Review Board for the Protection of Human Subjects at (512) 232-2685 or the Office of Research Support and Compliance at (512) 471-8871 or email: orsc@uts.cc.utexas.edu.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information and have sufficient information to make a decision about participating in this study. I consent to participate in the study.

Signature: _____ Date: _____

Dr. Zsuzsanna Abrams Date: 02/22/08
Signature of Person Obtaining Consent

Signature of Investigator: Katerina Theodoridou Date: 02/22/08

Appendix H: Chat script Excerpts

Excerpt from chat session between Laura and learner SE17

Human: hola laura [*Hello Laura*]

Laura - Spanish: Hola, ¿cómo te llamas? [*Hello, what's your name?*]

Human: me llamo [...] [*My name is ...*]

Laura - Spanish: ¡Hola! ¿Cómo estás? [*Hi, how are you?*]

Human: bien. [*Fine*]

Laura - Spanish: Perfecto. [*Perfect.*]

Human: que hora es? [*What time is it?*]

Laura - Spanish: Ahora mismo son las 12:52. [*Right now it is 12:52.*]

Human: que significa la palabra "brindar" [*What does the word "brindar" mean?*]

Laura - Spanish: Ofrecer algo a alguien. [*To offer something to someone.*]

Human: por favor, usa la palabra "brindar" en una oración [*Please use the word "brindar" in a sentence*]

Laura - Spanish: ¿Alguna vez has brindado ayuda o dinero a alguna organización? ¿Cómo? [*Have you ever offered help or money to an organization? How?*]

Human: cual es tu color favorito? [*What is your favorite color?*]

Laura - Spanish: ¿Realmente importa el color que sea? [*Does it really matter what color it is?*]

Human: que significa la palabra "el comercio justo" [*What does the word "el comercio justo" mean?*]

Laura - Spanish: El acto de comprar productos que dan un porcentaje más grande de ganancia a los productores. [*The act of buying products that provide the producers with a higher percentage of gain.*]

Human: usa esta palabra en una frase [*Use this word in a sentence*]

Laura - Spanish: Lo siento, pero no te entendí. ¿Puedes corregir los que me dijiste o decirme algo diferente? [*I'm sorry, but i didn't understand you. Can you correct what you said or tell me something else?*]

Human: usa la palabra "el comercio justo" en una frase [*Use the word "el comercio justo" in a sentence*]

Laura - Spanish: ¿Crees que es importante aprender más sobre el comercio justo? [*Do you think it is important to learn more about fair trade?*]

Human: sí, creo que es importante aprender mas sobre el comercio justo [*Yes, I think it is important to learn more about fair trade*]

Laura - Spanish: Yo también lo creo. [*I think so too.*]

Human: tienes un perro? [*Do you have a dog?*]

Laura - Spanish: Sí, tengo un perro. Se llama Azor. ¿Y tú? [*Yes, I have a dog. His name is Azor. And you?*]

Human: no tengo un perro [*I don't have a dog*]

Laura - Spanish: ¿Qué quieres decir con eso? ¿Cuál sería la respuesta correcta? [*What do you mean by that? What would the correct answer be?*]

Human: tienes un gato? [*Do you have a cat?*]

Laura - Spanish: No, tengo un perro. A mi no me gustan los gatos tanto. ¿Y tú? [*No, i have a dog. I do not like cats that much. And you?*]

Human: donde vives? [*Where do you live?*]

Laura - Spanish: Ahora vivo en Austin, pero he vivido en varios países como en México y en España. [*Now i live in Austin, but i have lived in different countries, like Mexico and Spain.*]

Human: que es tu trabajo? [*What is your job?*]

Laura - Spanish: Bueno, ayudo a los estudiantes que aprenden español. [*Well, I help students who learn Spanish.*]

Excerpt from chat session between Laura and learner SE20

Human: HOLA LAURA! *[Hello Laura!]*

Laura - Spanish: Hola, ¿cómo te llamas? *[Hello, what is your name?]*

Human: ME LLAMO [...]. *[My name is...]*

Laura - Spanish: ¡Hola! ¿Cómo estás? *[Hi, how are you?]*

Human: COMO ESTAS? *[How are you?]*

Laura - Spanish: Estoy bien, gracias por preguntar. ¿Y tú? *[I am fine, thanks for asking. And you?]*

Human: ESTOY BIEN. *[I'm fine.]*

Laura - Spanish: ¡Perfecto! *[Perfect!]*

Human: QUE ES UN EJEMPLO DE UN INNOVADOR? *[What is an example of innovative?]*

Laura - Spanish: Construir aparatos para que los astronautas viajen a otros planetas fue una idea innovadora, ya que nos ayudó a aprender mucho sobre esos planetas. *[Constructing equipment for astronauts to travel to other planets was an innovative idea, since it helped us learn more about those planets.]*

Human: QUE ES DESILUSIONANTE? *[What is disappointing?]*

Laura - Spanish: Pero no se qué me quieres decir con eso. *[I don't know what you want to tell me with that.]*

Human: QUAL ES UN EJEMPLO DE EL AVANCE? *[What is an example of advance?]*

Laura - Spanish: A causa de los avances tecnológicos en el campo de educación, durante la última década se ofrecen más cursos en línea o a distancia. *[Due to the technological advances in the field of education, during the last decade more courses are offered online or for distance-learning.]*

Human: ES POSIBLE A AVISAR UNA PERSONA? *[Is it possible to inform someone?]*

Laura - Spanish: ¿Cómo podemos avisar a más personas de los problemas que existen en el mundo? *[How can we inform more people of the problems that exist in the world?]*

Human: PODEMOS BRINDAR AYUDA. *[We can offer help.]*

Laura - Spanish: ¿Crees que los programas de colaboración entre países que brindan varias organizaciones internacionales son beneficiosos o no? *[Do you think that the programs of collaboration between different countries, which various international organizations offer, are beneficial or not?]*

Human: ES POSIBLE A ENRIQUECER UNA EDUCACION? *[Is it possible to enrich education?]*

Laura - Spanish: ¿Crees que hay opciones o maneras fáciles que ayudan a enriquecernos? *[Do you think there are easy options or ways that help us enrich ourselves?]*

Human: SI, CREO QUE HAY OPCIONES QUE AYUDAN A ENRIQUECERNOS. *[Yes, I think there are options that help us enrich ourselves.]*

Laura - Spanish: Yo también lo creo. *[I think so too.]*

Human: GRACIAS LAURA PARA TU TIEMPO. *[Thank you for your time Laura.]*

Laura - Spanish: Encantada. *[You are welcome.]*

References

- Abrams, Zs. I. (2002). Surfing to Cross-Cultural Awareness: Using Internet-Mediated Projects to Explore Cultural Stereotypes. *Foreign Language Annals*, 35 (2), 141-160.
- André, E, Rist, T., & Müller, J. (1999). Employing AI Methods to Control the Behavior of Animated Interface Agents. *Applied Artificial Intelligence*, 13, 415-448.
- Arnaud P. J. L., & Savignon, S. J. (1997). Rare Words, Complex Lexical Units, and the Advanced Learner. In J. Coady & T. Huckin (Eds.), *Second Language Vocabulary Acquisition* (pp. 157-173). Amsterdam: John Benjamins.
- Atkinson, R. (1972). Optimizing the Learning of a Second-language Vocabulary. *Journal of Experimental Psychology*, 96, 124-129.
- Atkinson, R. (2002). Optimizing Learning from Examples Using Animated Pedagogical Agents. *Journal of Educational Psychology*, 94 (2), 416-427.
- Bandura, A. (2001). Social Cognitive Theory: An Agentic Perspective. *Annual Review of Psychology*, 52, 1-26.
- Barab, S.L., & Duffy, T.M. (2000). From practice fields to communities of practice. In D.H. Jonassen & S.M. Land (Eds.), *Theoretical foundations of learning environments* (pp. 1-23). Mahwah, NJ: Lawrence Erlbaum.
- Barcroft, J. (2004). Second Language Vocabulary Acquisition: A Lexical Input Processing Approach. *Foreign Language Annals*, 37 (2), 200-208.
- Bates, J. (1994). The Role of Emotion in Believable Aagents. *Communications of the ACM*, 37 (7), 122-125.
- Baylor, A. L. (1999). Intelligent Agents as Cognitive Tools. *Educational Technology*, 39 (2), 36-40.
- Baylor, A. L. (2000). Beyond Butlers: Intelligent Agents as Mentors. *Journal of Educational Computing Research*, 22 (4), 373-382.
- Baylor, A. L., & Ruy, J. (2003). Does the Presence of Image and Animation Enhance Pedagogical Agent Persona? *Journal of Educational Computing Research*, 28 (4), 373-395.

- Baylor, A. L., Shen, E., & Warren, D. (2004). *Supporting learners with math anxiety: The impact of pedagogical agent emotional and motivational support*. Paper presented at the Workshop on "Social and Emotional Intelligence in Learning Environments," held at the International Conference on Intelligent Tutoring Systems., Maceió, Brazil. Retrieved September 29, 2004 from http://pals.fsu.edu/papers/W7_baylor_revised.pdf
- Beauvois, M. H. (1998). Conversations in Slow Motion: Computer-Mediated Communication in the Foreign Language Classroom. *The Canadian Modern Language Review*, 54, 198-217.
- Bernhardt, E., & Kamil, M. (1998). Enhancing Foreign Culture Learning through Electronic Discussion. In J. A. Muyskens (Ed.), *New Ways of Learning and Teaching: Focus on Technology and Foreign Language Education* (pp. 39-55). Boston, MA: Heinle & Heinle.
- Blake, Robert. (2000). Computer Mediated Communication: A Window on L2 Spanish Interlanguage. *Language Learning & Technology*, 4 (1), 120-136.
- Bosseler, A. & Massaro, D. W. (2003). Development and Evaluation of a Computer-Animated Tutor for Vocabulary and Language Learning in Children with Autism. *Journal of Autism and Developmental Disorders*, 33 (6), 653-672.
- Carroll, S. (2001). *Input and Evidence: The Raw Material of Second Language Acquisition*. Amsterdam: Benjamins.
- Carroll, S., Roberge, Y., & Swain, M. (1992). The Role of Feedback in Adult Second Language Acquisition: Error Correction and Morphological Generalizations. *Applied Psycholinguistics*, 13, 173-198.
- Carroll, S., & Swain, M. (1993). Explicit and Implicit Negative Feedback: An Empirical Study of the Learning of Linguistic Generalizations. *Studies in Second Language Acquisition*, 15, 357-366.
- Carter, R., & McCarthy, M. (1988). *Vocabulary and Language Teaching*. London: Longman.
- Cattell, J. M., & Bryant, S. (1889). Mental Association Investigated by Experiment. *Mind*, 14, 230-250.
- Chan, T.W. (1996) Learning Companion Systems, Social Learning Systems, and the Global Social Learning Club. *Journal of Artificial Intelligence in Education*, 7, 2.
- Chandler, P., & Sweller, J. (1991). Cognitive Theory and the Format of Instruction. *Cognition and Instruction*, 8, 293-332.

- Chapelle, C. (2001). *Computer Applications in Second Language Acquisition: Foundations for Teaching, Testing, and Research*. New York: Cambridge University Press.
- Choi, S., & Clark, R. (2006). Cognitive and Affective Benefits of an Animated Pedagogical Agent for Learning English as a Second Language. *Journal of Educational Computing Research*, 34 (4), 441-466.
- Chun, D. (1994). Using Computer-Networking to Facilitate the Acquisition of Interactive Competence. *System*, 22 (1), 17-31.
- Clarebout, G., & Elen, J. (2007). In Search of Pedagogical Agents' Modality and Dialogue Effects in Open Learning Environments. *e-JIST*, 10 (1), 1-15.
- Clark, R.E. (1990). *The contributions of cognitive psychology to the design of technology supported powerful learning environments*. California: University of Southern California.
- Clark, R., & Choi, S. (2005). Five Design Principles for Experiments on the Effects of Animated Pedagogical Agents. *Journal of Educational Computing Research*, 32 (3), 209-225.
- Coady, J. (1993). Research on ESL/EFL Vocabulary Acquisition: Putting it in Context. In T. Huckin, M. Haynes and J. Coady (Eds.), *Second Language Reading and Vocabulary Learning* (pp. 3-23). Norwood, NJ: Ablex Publishing Corporation.
- Cohen, A. D., & Apeh, E. (1981). Easyfying Second Langaueg Learning. *Studies in Second Language Acquisition* 3(2), 221-326.
- Collins, A., Brown, J. S., & Newman, S. E. (1989). Cognitive Apprenticeship: Teaching the Crafts of Reading, Writing, and Mathematics. In L. B. Resnick (Ed.), *Knowing, Learning, and Instruction: Essays in Honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Craig, S., Gholson, B., & Driscoll, D. (2002). Animated pedagogical agents multimedia educational environments: Effects of agent properties, picture features, and redundancy. *Journal of Educational Psychology*, 94 (2), 428-434.
- De Corte, E., Verschaffel, L., & Lowyck, J. (1994). Computers and learning. In T. Husen & T.N. Postlewaite (Eds.), *International encyclopedia of education*. Oxford, NY: Pergamon Press.
- De la Fuente, M. J. (2003). Is SLA Interactionist Theory Relevant to CALL? A Study on the Effects of Computer-Mediated Interaction in L2 Vocabulary Acquisition. *Computer Assisted Language Learning*, 16 (1), 47-81.

- Dehn, D. M., & van Mulken, S. (2000). The Impact of Animated Interface Agents: A Review of Empirical Research. *International Journal of Human-Computer Studies*, 52 (1), 1-22.
- Dewey, J. (1913). *Interest and Effort in Education*. Cambridge, MA: Houghton-Mifflin.
- Doering, A., & Veletsianos, G. (2007). Multi-Scaffolding Learning Environment: A analysis of Scaffolding and its Impact on Cognitive Load and Problem-Solving Ability. *Journal of Educational Computing Research*, 37 (2), 107-129.
- Doering, A., Veletsianos, G., & Yerasimou, T. (2008). Conversational Agents and their Longitudinal Affordances on Communication and Interaction. *Journal of Interactive Learning Research*, 19 (2), 251-270.
- Doughty, C., & Varela, E. (1998). Communicative Focus on Form. In C. Doughty & J. Williams (Eds.), *Focus on Form in Classroom Second Language Acquisition* (pp. 114–138). New York: Cambridge University Press.
- Dowling, C. (2000). Intelligent Pedagogical Agents in Online Learning Environments. Retrieved April 16, 2006, from the International Conference on Educational Uses of Communication and Information Technologies Web Site: <http://www.ifip.or.at/con2000/iceut2000/iceut02-03.pdf>
- Ebbinghaus, H. (1885). *Über das Gedächtnis*. Leipzig, Duncker. Translated by H. Ruger & C. E. Bussenius (1913). Cited in R. S. Woodworth & H. Schlosberg (1955), *Experimental Psychology*. London: Methuen.
- Ellis, N. C., & Beaton, A. (1993). Factors Affecting the Learning of Foreign Language Vocabulary: Imagery Keyword Mediators and Phonological Short-term Memory. *Quarterly Journal of Experimental Psychology*, 46, 533-558.
- 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.
- Ellis, R., Loewen, S., & Erlam, R. (2006). Implicit and Explicit Corrective Feedback and the Acquisition of L2 Grammar. *Studies in Second Language Acquisition*, 28 (2), 339-368.
- Forbus, K., & Kuehne, S. (1998). RoboTA: An agent colony architecture for supporting education. Proceedings of the second international conference on Autonomous agents, Minneapolis, MN. Retrieved December 8, 2004 from <http://doi.acm.org/10.1145/280765.280895>
- Foerster, S., & Lambright, A. (2007). *Punto y Aparte*. New York, NY: The McGraw-Hill Companies, Inc.

- Gall, M., Gall, J., & Borg, W. (2003). *Educational Research. An Introduction*. 7th ed. Boston, MA: Allyn and Bacon.
- Gass, S. M. (1999). Discussion: Incidental Vocabulary Learning. *Studies in Second Language Acquisition*, 21 (2), 319-333.
- Gass, S., & Selinker, L. (2001). *Second Language Acquisition: An Introductory Course*. Mahwah, NJ: Lawrence Erlbaum.
- Glaser, B. G., & Strauss, A. L. (1967). *The Discovery of Grounded Theory*. Chicago, IL: Aldine.
- Graesser, A., Wiemer-Hastings, K., Wiemer-Hastings, P., Kreuz, R., and the Tutoring Research Group. (1999). Auto-tutor: A Simulation of a Human Tutor. *Journal of Cognitive Systems Research*, 1, 35-51.
- Gu, Y., & Johnson, R. (1996). Vocabulary Learning Strategies and Language Learning Outcomes. *Language Learning*, 46, 643-679.
- Gulz, A. (2004). Benefits of Virtual Characters in Computer-based Learning Environments: Claims and Evidence. *International Journal of Artificial Intelligence in Education*, 14, 313-334.
- Harp, S. F., & Mayer, R. E. (1998). How Seductive Details do their Damage: A Theory of Cognitive Interest in Science Learning. *Journal of Educational Psychology*, 90, 414-434.
- Hatch, E. (Ed.). 1978. *Second Language Acquisition: A Book of Readings*. Rowley, MA: Newbury House.
- Haynes, M. (1993). Patterns and Perils of Guessing in Second Language Reading. In T. Huckin, M. Haynes and J. Coady (Eds.), *Second Language Reading and Vocabulary Learning* (pp. 46-64). Norwood, NJ: Ablex Publishing Corporation.
- Hershey-Dirkin, K., Mishra, P., & Altermatt, E. (2005). All or Nothing: Levels of Sociability of a Pedagogical Software Agent and its Impact on Student Perceptions and Learning. *Journal of Educational Multimedia and Hypermedia*, 14 (2), 113-127.
- Huckin, T., & Coady, J. (1999). Incidental Vocabulary Acquisition in a Second Language: A Review. *Studies in Second Language Acquisition*, 21 (2), 181-193.
- Hulstijn, J. H. (1992). Retention of Inferred and Given Word Meanings: Experiments in Incidental Vocabulary Learning. In P. J. Arnaud & H. Bejoint (Eds.), *Vocabulary and Applied Linguistics* (pp. 113-125). London: MacMillan.

- Hulstijn, J. (1993). When Do Foreign-Language Readers Look up the Meaning of Unfamiliar Words? The Influence of Task and Learner Variables. *The Modern Language Journal* 77(2), 139-147.
- Hulstijn, J. H. (2001). Intentional and Incidental Second Language Vocabulary Learning: A Reappraisal of Elaboration, Rehearsal, and Automaticity. In P. Robinson (Ed.), *Cognition and Second Language Instruction* (pp. 258-286). New York: Cambridge University Press.
- Hwang, K., & Nation, P. (1989). Reducing the Vocabulary Load and Encouraging Vocabulary Learning Through Reading Newspapers. *Reading in a Foreign Language* 6(1), 323-335.
- James, M. (1996). *Improving Second Language Reading Comprehension: A Computer-Assisted Vocabulary Development Approach*. Dissertation, University of Hawaii, Monoa.
- Johnson, W. L. (1998). Pedagogical Agents. In Chan, T.W., Collins, A. & Lin, J. (Eds.), *Global Education on the Net Vol 1*, Proceedings of ICCE '98, the Sixth International Conference on Computers in Education, Beijing, China, 14 – 17 October 1998. Beijing: China Higher Education Press and Springer-Verlag.
- Jonassen, D.H. (1996). *Computers in the classroom: Mindtools for critical thinking*. Englewood Cliffs, NJ: Prentice Hall.
- Jonassen, D. (1999). Designing Constructivist Learning Environments. In J. Reigeluth (Ed.), *Instructional-Design Theories and Methods Vol 1* (pp. 215-239). Mahwah, NJ: Lawrence Erlbaum.
- Kalyuga, S., Chandler, P., & Sweller, J. (1999). Managing Split-Attention and Redundancy in Multimedia Instruction. *Applied Cognitive Psychology*, 13, 351-371.
- Kern, R. (1995). Restructuring Classroom Interaction with Networked Computers: Effects on Quantity and Characteristics of Language Production. *Modern Language Journal*, 79 (4), 457-476.
- Kim, Y. (2004). *Pedagogical agents as learning companions: The effects of agent affect and gender on learning, interest, self-efficacy, and agent persona*. Florida State University, Tallahassee, FL.
- Krashen, S. D. (1985). *The Input Hypothesis*. London: Longman.
- Laufer, B., & Hulstijn, J. H. (2001). Incidental Vocabulary Acquisition in a Second Language: The Construct of Task-induced Involvement. *Applied Linguistics*, 22, 1-26.

- Leahy, C. (2001). Bilingual Negotiation via E-mail: An International Project. *Computer Assisted Language Learning*, 14 (1), 15-42.
- Lee, L. (1997). Using Internet Tools as an Enhancement of C2 Teaching and Learning. *Foreign Language Annals*, 30 (3), 410-427.
- Lester, J., Converse, S., Kahler, S., Barlow, T., Stone, B., & Bhogal, R. (1997). The persona effect: Affective impact of animated pedagogical agents. *Proceedings of Human Computer Interaction (CHI), Association for Computing Machinery (ACM), 1997*, 359-366.
- Long, M. (1996). The Role of the Linguistic Environment in Second Language Acquisition. In W. C. Ritchie & T. K. Bhatia (Eds.), *Handbook of Second Language Acquisition* (pp. 413-468). New York: Academic Press.
- Long, M., Inagaki, S., & Ortega, L. (1998). The Role of Implicit Negative Feedback in SLA: Models and Recasts in Japanese and Spanish. *Modern Language Journal*, 82, 357-371.
- Lyster, R. (2004). Differential Effects of Prompts and Recasts in Form-focused Instruction. *Studies in Second Language Acquisition*, 26 (3), 399-432.
- Ma, Q. (2007). From Monitoring Users to Controlling User Actions: A New Perspective on the User-centered Approach to CALL. *Computer Assisted Language Learning*, 20 (4), 297-321.
- Mackey, A. (1999). Input, Interaction and Second Language Development: An Empirical Study of Question Formation in ESL. *Studies in Second Language Acquisition*, 21 (4), 557-587.
- Martens, R., & Dochy, F. (1997). Assessment and feedback as student support devices. *Studies in Educational Evaluation*, 23(3), 257-273.
- Massaro, D. W. (2004). Symbiotic Value of an Embodied Agent in Language Learning. *Proceedings of the 37th Hawaii International Conference on System Sciences*, 5, 50132.3.
- Massaro, D. W., & Light, J. (2003). Read my Tongue Movements: Bimodal Learning to Perceive and Produce Non-native Speech /r/ and /l/. *Proceedings of Eurospeech (Interspeech), 8th European Conference on Speech Communication and Technology*, Switzerland.
- Mayer, R. E., Dow, G. T., & Mayer, S. (2003). Multimedia Learning in an Interactive Self-Explaining Environment: What Works in the Design of Agent-Based Microworlds? *Journal of Educational Psychology*, 95 (4), 806-813.

- Mayer, R., & Moreno, R. (2004). Personalized Messages that Promote Science Learning in Virtual Environments. *Journal of Educational Psychology*, 96 (1), 165-173.
- Mayer, R. E., Sobko, K., & Mautone, P. D. (2003). Social cues in multimedia learning: Role of speaker's voice. *Journal of Educational Psychology*, 95, 419-425.
- Meara, P. (1989). Word Power and How to Assess It. *SELF*, 1, 20-24.
- Meara, P. (1990). Some Notes on the Eurocentres Vocabulary Tests. *AFinLA Yearbook*, 1990 (48), 103-113.
- Meara, P. (1996). The Dimensions of Lexical Competence. In G. Brown, K. Malmkjaer, & J. Williams, (Eds.), *Performance and Competence in Second Language Acquisition* (pp. 35-53). Cambridge: Cambridge University Press.
- Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education*. San Francisco, CA.: Jossey-Bass Publishers.
- Merrill, M.D. (1994). Prescriptions for an authoring system. In M.D. Merrill (Eds.), *Instructional design theory* (pp. 331-347). Englewood Cliffs, NJ: Educational Technology.
- Milton, J., & Meara, P. (1995). How Periods Abroad Affect Vocabulary Growth in a Foreign Language. *ITL Review of Applied Linguistics 107-108*, 17-34.
- Moreno, R., & Mayer, R. E. (2000). Engaging students in active learning: The case for Personalized Multimedia Messages. *Journal of Educational Psychology*, 92, 724-733.
- Moreno, R., Mayer, R. E., Spire, H. A., & Lester, J. C. (2001). The case for social agency in computer-based teaching: Do students learn more deeply when they interact with animated pedagogical agents? *Cognition and Instruction*, 19, 177-213.
- Muranoi, H. (2000). Focus on Form Through Interaction Enhancement: Integrating Formal Instruction into a Communicative Task in EFL Classrooms. *Language Learning*, 50, 617-673.
- Nakata, T. (2008). English Vocabulary Learning with Word Lists, Word Cards and Computers: Implications from Cognitive Psychology Research for Optimal Spaced Learning. *ReCALL*, 20 (1), 3-20.
- Nass, C., & Moon, Y. (2000). Machines and Mindlessness: Social Responses to Computers. *Journal of Social Issues*, 56 (1), 81-103.

- Nass, C., & Steuer, J. (1993). Computers, Voices, and Sources of Messages: Computers are Social Actors. *Human Communication Research*, 19 (4), 504-527.
- Nation, I. S. P. (1990). *Teaching and Learning Vocabulary*. Rowley, MA: Newbury House.
- Nation, I. S. P. (2001). *Learning Vocabulary in Another Language*. New York: Cambridge University Press.
- Norman, D. (1997). How Might People Interact with Agents? In J. M. Bradshaw (Ed.), *Software agents* (pp. 49-56). Menlo Park, CA: MIT Press.
- Omaggio Hadley, A. (2001). *Teaching Language in Context*. 3rd ed. Boston, MA: Heinle & Heinle.
- Osuna, M. (2000). Promoting Foreign Culture Acquisition via the Internet in a Sociocultural Context. *Journal of Educational Computing Research*, 22 (3), 323-346.
- Palinscar, A. S. (1998). Social Constructivist Perspectives on Teaching and Learning. *Annual Review of Psychology*, 49 (1), 345-375.
- Papert, S. (1993). *The children's machine: Rethinking school in the age of the computer*. New York: Basic Books.
- Paribakht, T., & Wesche, M. (1993). Reading Comprehension and Second Language Development in a Comprehension-based ESL Program. *TESL Canada Journal*, 11, 9-29.
- Paribakht, T., & Wesche, M. (1997). Vocabulary Enhancement Activities and Reading for Meaning in Second Language Vocabulary Development. In J. Coady & T. Huckin (Eds.), *Second Language Vocabulary Acquisition* (pp. 174-200). Amsterdam: John Benjamins.
- Prendinger, H., & Ishizuka, M. (2001). Let's talk! Socially Intelligent Agents for Language Conversation Training. *IEEE Transactions on Systems, Man, and Cybernetics*, 31(5), 465-471.
- Prince, P. (1996). Second Language Vocabulary Learning: The Role of Context Versus Translations as a Function of Proficiency. *The Modern Language Journal*, 80, 478-493.
- Ranalli, J. (2008). Learning English with The Sims: Exploiting Authentic Computer Simulation Games for L2 Learning. *Computer Assisted Language Learning*, 21 (5), 441-455.

- Read, J. (1993). The Development of a New Measure of L2 Vocabulary Knowledge. *Language Testing*, 10, 355-371.
- Read, J. (1995). Refining the Word Associates Format as a Measure of Depth of Vocabulary Knowledge. *New Zealand Studies in Applied Linguistics*, 1, 1-17.
- Reeves, B., & Nass, C. (1996). *The media equation*. New York: Cambridge University Press.
- Reid, J. M. (1995). *Learning Styles in the EL/EFL Classroom*. Boston, MA: Newbury House.
- Renninger, K. A., Hidi, S., & Krapp, A. (Eds.). (1992). *The Role of Interest in Learning and Development*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Rieber, L. P. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research and Development*, 44 (2), 43-58.
- Romiszowski, A. J. (1990). The Hypertext/Hypermedia Solution - But What Exactly is the Problem? In D. H. Jonassen & H. Mandl (Eds.), *Designing Hypermedia for Learning*. Berlin: Springer-Verlag.
- Salaberry, R., Barrette, C. M., Elliott, P., & Fernández-García, M. (2004). *Impresiones*. Upper Saddle River, NJ: Pearson Education, Inc.
- Salomon, G. (1994). *Interaction of media, cognition, and learning*. Hillsdale, NJ: Lawrence Erlbaum.
- Santa Ana, O., & Parodi, C. (1998). Modeling the speech community: Configurations and variable types in the Mexican Spanish setting. *Language in Society*, 27 (1), 23-51.
- Schallert, D. L., & Martin, D. B. (2003). A psychological analysis of what teachers and students do in the language arts classroom. In J. Flood, D. Lapp, J. R. Squire, & J. M. Jensen (Eds.), *Handbook of research on teaching the English language arts* (2nd ed., pp. 31-45). New York: Macmillan.
- Schmitt, N. (1997). Vocabulary Learning Strategies. In N. Schmitt & M. McCarty (Eds.), *Vocabulary: Description, Acquisition, and Pedagogy* (pp. 199-227). Cambridge: Cambridge University Press.
- Schmitt, N. (2000). *Vocabulary in Language Teaching*. New York: Cambridge University Press.
- Schmitt, N., & McCarthy, M. (Eds.). (1997). *Vocabulary: Description, Acquisition, and Pedagogy*. New York: Cambridge University Press.

- Schmitt, N., Schmitt, D., & Clapham, C. (2001). Developing and Exploring the Behavior of Two New Versions of the Vocabulary Levels Test. *Language Testing*, 18 (1), 55-88.
- Shaw, E., Johnson, W. L., & Ganeshan, R. (1999). *Pedagogical agents on the web*. Retrieved April 16, 2006, from the Information Sciences Institute Web Site: <http://www.isi.edu/isd/ADE/papers/agents99/agents99.htm>
- Smidt, E., & Hegelheimer, V. (2004). Effects of Online Academic Lectures on ESL Listening Comprehension, Incidental Vocabulary Acquisition and Strategy Use. *Computer Assisted Language Learning*, 17 (5), 517-556.
- Smith, B. (2004). Computer-Mediated Negotiated Interaction and Lexical Acquisition. *Studies in Second Language Acquisition*, 26 (3), 365-398.
- Sökmen, A. (1997). Current Trends in Teaching Second Language Vocabulary. In N. Schmitt & M. McCarty (Eds.), *Vocabulary: Description, Acquisition, and Pedagogy* (pp. 199-227). Cambridge: Cambridge University Press.
- Toyoda, E. (2000). Categorization of text chat communication between learners and native speakers of Japanese. *Language Learning and Technology*, 6, 82-99.
- vanVuuren, S. (2007). Technologies that Empower Pedagogical Agents and Visions for the Future. *Educational Technology*, 47 (1), 4-10.
- Veletsianos, G. & Yerasimou, T. (2005). The Use of an Animated Pedagogical Agent to Help Learners Develop their Electronic Portfolios. *Proceedings of the 16th International SITE Conference*, Phoenix, AZ.
- Vives Boix, G. (1995). The Development of a Measure of Lexical Organization: The Association Vocabulary Test. PHD - dissertation, University College of Swansea, University of Wales.
- Vygotsky, L. S. (1978). *Mind in Society*. Cambridge, MA: Harvard University Press.
- Warschauer, M. (1995/1996). Comparing Face-to-Face and Electronic Discussion in the Second Language Classroom. *CALICO*, 13 (2 & 3), 7-26.
- Warschauer, M. (1997). Computer-Mediated Collaborative Learning: Theory and Practice. *Modern Language Journal*, 81, 4, 470-481.
- Warschauer, M. (2000). Online Learning in Second Language Classrooms: An Ethnographic Study. In M. Warschauer, & R. Kern (Eds.), *Network-Based Language Teaching: Concepts and Practice* (pp. 41-58). Cambridge: Cambridge University Press.

Woodworth, R. S., & Schlosberg, H. *Experimental Psychology*. London: Methuen, 1955.

Zimmerman, C. (1997). Historical Trends in Second Language Vocabulary Instruction. In J. Coady & T. Huckin (Eds.), *Second Language Vocabulary Acquisition* (pp. 5-19). Amsterdam: John Benjamins.

Vita

Katerina Demetre Theodoridou was born in Larnaca, Cyprus, on February 23, 1980, the daughter of Demetres Theodorides and Eleftheria (Ria) Theodoridou. After completing her studies at the American Academy in Larnaca, Cyprus in 1998, she entered The University of Texas at Austin to pursue a bachelor's degree. She received the degree of Bachelor of Arts in German and Spanish (double major) from the University of Texas at Austin in May, 2002. The following August she entered the Graduate School at The University of Texas at Austin to pursue the degree of Master of Arts in Foreign Language Education. During her graduate studies she was a teaching assistant in the Department of Germanic Studies and taught first-year German to undergraduate students. She received the degree of Master of Arts in May, 2004 and the following August she entered the Doctoral program in Foreign Language Education at The University of Texas at Austin. During her Doctoral years she was an Assistant Instructor in the Department of Spanish and Portuguese and taught first- and second- year Spanish to undergraduate students. In 2007, she co-authored *En contexto: Manual de lecturas y películas*, an intermediate Spanish workbook focusing on the use of movies and related contextualized readings to teach culture. In 2008, she co-authored an article on the use of film to teach culture in the foreign language classroom in the journal *Texas Papers in Foreign Language Education*.

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