2011

Effects Of Computer-assisted Language Learning (call) Instruction On The Acquisition Of Passive Grammatical Forms By Post-secondary English As A Second Language (esl) Students

Ya Chi Chien
University of Central Florida

EFFECTS OF COMPUTER-ASSISTED LANGUAGE LEARNING (CALL) INSTRUCTION ON THE ACQUISITION OF PASSIVE GRAMMATICAL FORMS BY POST-SECONDARY ENGLISH AS A SECOND LANGUAGE (ESL) STUDENTS

by

YA-CHI CHIEN
LL.B. Soochow University, 2004
M.A. University of Central Florida, 2008

A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Education in Curriculum and Instruction
in the School of Teaching, Learning and Leadership
in the College of Education
at the University of Central Florida
Orlando, Florida

Summer Term
2011

Major Professor: Joyce W. Nutta

ABSTRACT

The purpose of this study is to compare Computer-Assisted Language Learning (CALL) grammar instruction with traditional classroom teacher-directed grammar instruction for post-secondary English as a Second Language (ESL) students enrolled in an Intensive English Program (IEP). Students' achievement was measured by their performance on three measures (multiple choice, cloze/fill-in-the-blank, and open-ended tests) of passive grammatical forms. This study gathered quantitative data on students' performance on the three measures for both teacher-directed and CALL instruction groups as well as qualitative data with respect to the CALL participants' perception of the *Azar Interactive* online grammar instruction program.

Results of the mixed design repeated measures factorial MANOVA (multivariate analysis of variance) showed that there was no statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a conventional classroom setting as compared to those taught solely by CALL. However, there was a statistically significant increase in scores on the open-ended tests for Level 4, the most advanced students at the IEP from pretest to delayed test as well as from posttest to delayed test. Students' level of proficiency affected the amount of increase in their scores over time regardless of the method of instruction. This study has offered a research-based indication that CALL instruction was as effective as traditional classroom teacher-directed instruction for teaching grammar to students of different levels of English proficiency. Recommendations for future research have also been discussed.

DEDICATION

To my beloved Grandmother, Lee Jung, and Dr. Marcella L. Kysilka.

ACKNOWLDGMENTS

I would like to express my immense gratitude and appreciation to many important people to this study without whom I would not have been able to complete my dissertation research, and I give thanks for the opportunity to recognize the contributions of them to this study.

First of all, I would like to thank my advisor and the Chair of this Dissertation Committee, Dr. Joyce W. Nutta for guiding me and encouraging me throughout my academic program and for her constructive comments and invaluable suggestions to this work. I am very grateful for the untiring help and support of Dr. Marcella L. Kysilka for her intelligence, kindness, wise suggestions on my dissertation, and unfailing love and support. I would like to recognize the contributions of Dr. M.H. Clark at the Computing And Statistical Technology Laboratory in Education (CASTLE) Statistics Lab to this study. I appreciate her incredible expertise in the field of Statistics and professional assistance with my data analyses. I am thankful for the help and support of my dissertation committee: Dr. Conrad Katzenmeyer, for his kindness and for helping me with Statistics, always offered cheerfully and generously; Dr. Florin Mihai, for his resourcefulness, kindness, and for his insights into Second Language Acquisition; Dr. Edwidge Crevecoeur-Bryant, for her wholehearted encouragement and wise advice on my research. I am truly thankful for having such wonderful dissertation committee members to work with during the course of this study.

I would like to give special thanks to my family: To my Grandmother, Lee Jung, for raising me as her daughter and for taking care of me since I was little, and most of all, for her deepest love and support throughout my life, without which I would not have been able to complete my dissertation study. I have loved her with all my heart. I will always miss her and

love her, and she will always live inside my heart and be with me wherever I go and no matter where I am; to my mother, Dr. Mei-Mei Tsai, for always being there for me whenever I need her and for her endless love and support throughout the years; to my father, Dr. Hou-Tsung Chien, who serves as my role model and cements my commitment to higher education; to my sisters, Dr. Ya-Chen Chien for her love and her great assistance with my data collection process and my younger sister, Ya-Lan Chien for her love and spiritual support. I could not have completed my dissertation without the wonderful support from my beloved family members. They are the source of my strength and the love of my life.

A special thanks is due to the faculty and staff of the College of Education, to Dr. Edward H. Mike Robinson, Dr. Grant Hayes, Dr. Michael Hynes, Dr. Michele Gregoire Gill, Dr. Jacquelyn Flanigan, and Mrs. Leah Mitchell-Fisher, for their tremendous help with my plan of study throughout the entire doctoral program. In addition, I would like to express my appreciation to all the faculty and staff of the English Language Institute who have been an enormous support to this research, and especially to the Director of the Intensive English Program, Mrs. Myrna Creasman and Mrs. Deodith Mapas.

My deepest gratitude belongs to my husband, Che-Kuang George Lin, who has always loved me, believed in me, supported me, and been there for me to help me overcome many challenges in my life, for without whom I would not have been able to complete my dissertation research. I am truly grateful for his assistance in finding the perfect software to use in this study and for his incredible help with my data collection process. He is the meaning of my life and the source of my happiness now and forever.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

As computer technology has advanced and become more user-friendly, greater attention has been paid to its potential benefits in language learning and acquisition. Since language instructors are using computers more frequently in teaching, it is necessary to examine the appropriate role of Computer-Assisted Language Learning (CALL) in curriculum and instruction for its research-based indications.

Introduction and Background of the Study

In the interdisciplinary field of Instructional Technology (IT) and Second Language Acquisition (SLA), numerous studies have been conducted to examine the following two issues: a) Does traditional classroom teacher-directed instruction in conjunction with the use of computers lead to better learning outcomes than classroom instruction alone? b) Are there any differences in outcomes for students who are taught only by classroom instruction versus those who are taught solely by Computer-Assisted Language Learning (CALL)? The former issue discusses whether or not computers could serve as tools of reinforcement for classroom instruction, but even with the use of computers, it essentially claims that classroom instruction is still indispensable to second language learning. The latter issue explores the differences in outcomes between students taught only by CALL instruction and those taught solely by traditional classroom instruction. In other words, it probes the question whether computers can supplant rather than supplement classroom instruction for second language acquisition. The researcher of this study intended to focus primarily on the latter issue.

In the field of SLA, questions with respect to the role of computers in instruction are crucial. Generally, CALL proponents have advocated the development of communicative CALL

programs that provide opportunities for *meaningful communication* (Garrett, 1991; see also Lavine, 1992; Quinn, 1990; Underwood, 1993), which is what many SLA researchers (e.g., Krashen, 1981) assert should occur in a second language classroom. In other words, computers should be used to replicate real and meaningful communication as well as teacher-to-student and student-to-student interaction in the classroom.

The teaching context often determines the role of CALL. In an English as a Second Language (ESL) environment, the communicative CALL program often supplements and augments the classroom activities by providing games for practice or word processing for composition (Nutta, 1996). Soo and Ngeow (1996) indicated that in some English as a Foreign Language (EFL) programs, the computer either completely supersedes or complements classroom instruction by providing instruction in subject areas or language skills not taught by classroom teacher. In the latter study, Soo and Ngeow (as cited in Nutta, 1996) concluded that computers and other technology are relied upon by the instructors in the EFL programs, many of whom are non-native English speakers, to provide a model of native speech that they cannot offer (Soo & Ngeow).

In addition to the significance of providing a communicative learning atmosphere, grammar instruction is also considered to be imperative in the SLA field. The use of computers to teach grammar had not received the same amount of attention as communicative CALL did approximately fifteen years ago when Nutta (1996) examined the effectiveness of using computer to teach grammar to ESL students; however, it has been drawing much attention of SLA researchers nowadays. There are many benefits to CALL grammar instruction, e.g., it could provide rich input and explicit grammar explanations through integrated multimedia programs.

By extending Nutta's (1996) study which examined the effectiveness of using computer to teach the past tense and the conditional to post-secondary ESL students, the researcher of the present study investigated the effectiveness of CALL grammar instruction by comparing two groups of students, i.e., one was taught passive grammatical forms by CALL instruction and the other was taught the same structure through traditional classroom teacher-directed instruction.

Statement of the Problem

There is a substantial amount of research on various types of Computer-Assisted Language Learning (CALL) and on second language grammar instruction in general; however, a detailed search of ERIC - EBSCOhost, Linguistics and Language Behavior Abstracts (LLBA), Education Full Text, Dissertations & Theses: Full Text, Web of Science, MLA International Bibliography, Project MUSE, PsychInfo, WorldCat, and ArticleFirst found few studies which directly compared CALL grammar instruction with traditional classroom teacher-directed grammar instruction for ESL students. The first researcher who looked at the effects of CALL grammar instruction in comparison with teacher-directed grammar instruction on the acquisition of past tense and the conditional was Nutta (1996). Because there are only few studies that make direct comparison between CALL grammar instruction and teacher-directed grammar instruction for ESL students, the researcher intended to do follow-up research of Nutta's (1996) study.

The passive grammatical forms were selected to be examined as the form of focus for this study because passive voice is imperative for teachers to teach and to be learned by learners of English. According to language acquisition researchers (Quirk, Greenbaum, Leech, & Svartvik, 1985), it is particularly useful and recommended in two situations: 1) When it is more important to draw our attention to the person or thing acted upon. For example: The unidentified victim

was apparently struck this morning; 2) When the actor in the situation is not important. For instance: The aurora can be observed at dawn. Furthermore, the passive voice is especially helpful and even regarded as mandatory in scientific or technical writing or laboratory reports, where the actor is not really important, but the process or principle being described is of ultimate importance. Instead of writing "I poured 20 cc of acid into the beaker," we would write "Twenty cc of acid was poured into the beaker." Based on the above reasons, the passive construction was chosen as the target grammatical structure to be studied in this dissertation research.

The researcher has explored interactionist theory to explain why the research questions were being asked in this study. According to interactionist approaches to SLA (Hatch, 1978; Long, 1996), *interaction* is the most important way in which learners obtain data for language learning. In Long's (1996) Interactionist Hypothesis theory, he claimed that interactive tasks that promote negotiation of meaning among learners can facilitate the development of a second language. Negotiation is often product of interactional exchanges where communication breakdowns take place. Normally the learner receives interactionally modified input, and she or he is also pushed to produce interactionally modified output (Swain, 1985).

Interactionist theory focuses on the *interaction* component of the computational model: input, *interaction*, output. Based on the interactionist theory discussed above, the conventional classroom instruction seems to be able to provide more mediation for learning because mediated learning occurs through social interaction. According to Ellis (2008), a primary means of mediation is verbal interaction. He stated that L2 acquisition is not a purely individual-based process, but is one shared between the individual and other people.

In this study, there was a group of students learning grammar in a conventional classroom setting and a group of students learning grammar from a Computer-Assisted Language Learning (CALL) software/online program. Although the present study is based on the interactionist theory, according to the sociocultural theory (SCT) which is an alternative view on *interaction*, it could be argued that the traditional classroom instruction is indispensible in terms of providing the social interaction needed to foster learning and the assistance of an adult (an expert), in this case, the classroom teacher, to help students achieve the desired language learning outcome and to provide children with experiences which are in their ZPD, and thereby encouraging and advancing their individual learning (Vygotsky, 1978). Nevertheless, in the traditional classroom where students could have social interaction with their teacher and peers, the amount or degree of interaction between the teacher and each individual student might be very different. While some students are more active in the classroom and would ask questions and receive feedback from their teacher or peers, others may be quieter in the classroom and would be reluctant to raise any questions or concerns they might have in class. This way, for each individual student, the opportunities for social interaction in the conventional classroom may depend on her or his personality, and therefore, are not the same. Whereas, the interaction students may have with the computer is identical since each student can get immediate corrective feedback from the CALL courseware/online program as soon as they hit the "check answers" button in the program.

A Computer-Assisted Language Learning (CALL) software may be able to provide assistance to learners as an expert, just like what a classroom teacher can do; nevertheless, the researcher intended to investigate if the *interactive* CALL software can provide the essential social interaction that is crucial for learning as a regular classroom instruction is capable of

providing to students. Since the *Azar Interactive* online courseware that was used in this study is not just a standard step by step computer program, i.e., the *Azar Interactive* software is literally an interactive program, students could have constant interaction with the program because when students do the practice exercises, they can check their answers at anytime and obtain immediate corrective feedback from the CALL program. As the interactionist theory suggests, the purpose of *interaction* is to engage students in learning and to provide immediate feedback and opportunities for changes and corrections, which is also an important type of interaction that is essential to the second language acquisition process. Therefore, each individual student using the CALL software would have equal opportunity to interact with the program and receive instant feedback from it. In addition, because students in the CALL grammar instruction group worked individually on the *Azar Interactive* software, they were not afraid of making mistakes as they might feel embarrassed in their regular teacher-directed classroom. The above interactionist theory was the research foundation of this study and was used to explain why the research questions were being asked in the present study.

Purpose of the Study

The purpose of the study is to examine the effectiveness of using the computer to teach grammar to English as a Second Language (ESL) students enrolled in a post-secondary English Language Institute. This study examined the acquisition of passive grammatical forms by the ESL students at the Intensive English Program (IEP), and this was evaluated by comparing the CALL students' performance with that of the classroom students on multiple choice, cloze/fill-in-the-blank, and open-ended tests. Students' level of English proficiency is part of the factorial design of the study.

Research Questions

The research questions of this study were:

1. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher-directed classroom setting as compared with ESL students taught by CALL (Computer-Assisted Language Learning)?
2. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher-directed classroom setting as compared with ESL students taught by CALL (Computer-Assisted Language Learning) based on their current English proficiency level (low intermediate, high intermediate, and advanced)?

Operational Definitions

CAI/CALL: Computer-Assisted Instruction (CAI) refers to the use of computers to assist in instructional activities. It is commonly used to refer to applications such as drill and practice, tutorials, simulations, and educational games. CAI is the umbrella term for the use of computers to assist in instructional activities in general. Therefore, CAI could be applied to many different fields of study such as physics, chemistry, mathematics, social sciences, etc. Under the umbrella term of CAI, Computer-Assisted Language Learning (CALL) is defined as the use of computers in assisting second or foreign language instructional activities. In other words, CALL is CAI applied to second or foreign language learning and acquisition (Merrill, Tolman, Christensen, Hammons, Vincent, & Reynolds, 1986).

EFL: English as a Foreign Language. The role of English in countries where it is taught as a subject in schools but not used as a medium of instruction in education nor as a language of communication within the country (Richards, et al., 1992).

ESL: English as a Second Language. The role of English for immigrant and other minority groups in English-speaking countries (Richards et al., 1992).

Interaction: Three types of basic interaction indentified by Chapelle (2003) are *interpersonal* (between people), *intrapersonal* (within a person's mind), and that occurs between a person and a computer (*learner-computer*).

L1: First Language (often referred to as Native Language or Mother Tongue).

L2: Second Language (often used synonymously with Target Language).

Rationale

The rationale for this study was based on the following:

1) As the use of computers in language teaching increases, it is necessary to establish research-based indications of the appropriate role of CALL in curriculum and instruction.
2) Since it has been established that grammar instruction facilitates SLA (Long, 1983), various methods of teaching grammar, including CALL, must be evaluated.
3) Because authentic, two-way communication (i.e., speech recognition) is not yet technically possible with CALL, and since it is simple and inexpensive to provide this type of instruction in the classroom through teacher-to-student and student-to-student interaction, other advantages for CALL, such as the presentation of linguistic rules and examples as well as providing immediate corrective feedback, should be the primary focuses to be considered and assessed in this study.

4) Because authentic, communicative language use with an emphasis on rich input and meaningful interaction is the basis of an optimal second language learning environment (Ellis, 1985), classroom activities should concentrate on providing these opportunities. If CALL grammar instruction can be as effective as teacher-directed grammar instruction, then students could learn the grammatical constructions at home by utilizing CALL, and the majority of the class time can be devoted to communicative language teaching.

Limitations

This study was constrained by the following:

1) Participants in the control and experimental groups were limited to post-secondary English as a Second Language (ESL) students enrolled in an Intensive English Program (IEP) in Southeastern United States.
2) In this study, 122 participants took the pretest, and 107 participants took the posttest. The sample size *n* of the present study was relatively large; however, only 41 participants took the delayed test. Because the sample size for participants who took the pre, post, and delayed test was small ($n = 40$), the researcher had to run two separate mixed design repeated measures factorial MANOVAs to analyze the data for the one with 107 participants who took the pre and posttest, and for the other with 40 participants who took the pre, post, and delayed test. (Among the 41 participants who took the delayed test, there was one participant who did not take the posttest. Because that specific participant was excluded from the data analyses, there were only 40 participants who completed all three assessments for this study).

3) The experimental treatment period was limited to one week with the first day and the last day devoted to administer pretest and posttest respectively. Therefore, the actual treatment time was limited to five days.
4) The CALL instruction was limited to the multimedia program *Fundamentals of English Grammar Interactive* designed by Betty S. Azar.
5) Measurement of the students' achievement of the passive grammatical form was limited to three measures (cloze, multiple choice, and open-ended) from a test bank developed by the author of the *Azar Grammar Series*.
6) The classroom instruction was led by different teachers at the IEP.
7) The classroom instruction was altered by the reduction of class size due to half of the students' participation in the CALL instruction group (the experimental group).

Organization of the Study

There are five chapters in this study. Chapter one provides an introduction and background of the study and outlines the statement of the problem, purpose of the study, research questions, operational definitions, rationale, and limitations. Chapter two reviews and synthesizes the literature with respect to Second Language Acquisition (SLA) theory, Computer-Assisted Language Learning (CALL) as well as Interactionist Theory in SLA. Chapter three describes the methodology of the study, which details the population and sample of the participants, design of the study, instrumentation, as well as data collection procedures. Chapter four describes the statistical procedures used in analyzing the data and reports the results of the present study. Chapter five provides the summary of the findings, discussions of conclusions and implications, and recommendations for future research.

CHAPTER TWO: REVIEW OF THE LITERATURE

The terminology Computer-Assisted Instruction (CAI) was formed in the early 1960s when people first utilized computers in education. “When computers first entered education on a relatively broad basis in the early sixties, the term Computer-Assisted Instruction (CAI) was coined” (Russel, 1982, p.27). Blomeyer (1984) indicated that computers had been gaining greater significance in foreign language instruction. According to Garrett (1988), although the most commonly used acronym for the endeavor had been the generic CAI, there had also been increasingly frequent references to Computer-Assisted Language Learning (CALL).

CALL was defined by Merrill, Tolman, Christensen, Hammons, Vincent, and Reynolds (1986) as CAI applied to second or foreign language learning and acquisition. CAI is the umbrella term for the use of computers to assist in instructional activities in general. Therefore, CAI could be applied to many different fields of studies such as physics, chemistry, mathematics, social sciences, etc. Under the umbrella term of CAI, Computer-Assisted Language Learning (CALL) concerns the use of computers in assisting second or foreign language instructional activities. In other words, as Merrill et al. (1986) defined the term, CALL is CAI applied to second or foreign language learning and acquisition.

Although there are numerous research studies on CALL in general, the investigation of whether CALL grammar instruction is effective has not yet been widely-researched; therefore, the literature review in this study mainly examined research on subject areas that are pertinent to the research questions in the study or that pertain to the validity of the study. This review of the literature synthesized articles on the effectiveness of computer-assisted second language grammar instruction and is divided into the following sections:

1. Second Language Acquisition (SLA) Theory Relating to Computer-Assisted Language Learning (CALL) and Grammar Instruction. The present study is grounded in SLA theory, specifically focusing on how formal instruction and developmental sequences interact. Research on these issues has offered guidelines for practitioners, such as the need for formal and form-focused instruction as well as communicative and meaning-focused approaches.
2. Interactionist Theory in Second Language Acquisition (SLA). According to Long's (1991) interactionist theory in SLA, *interaction* is the most important way in which learners obtain data for language learning. Interactionist theory which emphasizes the *interaction* component of the computational model: input, *interaction*, output, serves as the main research base for this study.
3. Computer-Assisted Language Learning. While there is a substantial literature on CALL instruction, there are few studies that directly compared computer-assisted grammar instruction with teacher-directed grammar instruction. The first research document that studied CALL grammar instruction in comparison with teacher-directed grammar instruction was composed by Nutta (1996).
4. CALL and Second Language Grammar Instruction. A number of studies have been conducted to investigate the effects of using CALL in teaching L2 grammar and were included in this section of the review of the literature. Reviews of the *Azar Interactive* Online Programs, i.e., *Fundamental of English Grammar: Interactive* and *Understanding and Using English Grammar: Interactive* were composed by Overcast (2007) and Bouziane (2005) respectively.

Second Language Acquisition (SLA) Theory Relating to

Computer-Assisted Language Learning (CALL) and Grammar Instruction

For many decades, research and theories in Second Language Acquisition (SLA) have focused on various aspects of interaction in the target language. The role of input, interaction, output has always been central, while the discourse, pragmatic, and socialinguistic components of communicative competence have received less attention (Kim & Rissel, 2008). In Krashen's (1981) monitor model, comprehensible input is the unique element that promotes acquisition, which is the primary process responsible for the development of the interlanguage system. While many language educators agree that input processed by the learner is required to support language learning, most emphasize a major role for interaction and negotiation of meaning (Ellis, 1985; Gass, 1997; Hatch, 1978; Pica, 1994), for formal classroom study of language, including contextualized focus on form (Doughty & Williams, 1998; Long, 1991).

Current SLA Theory and CALL

While there are multiple theories in the literature that attempt to explain Second Language Acquisition (SLA) theory as it relates to Computer-Assisted Language Learning (CALL), the present study focuses primarily on interactionist theory as the main research underpinning.

Interactionist Theory

Mackey and Gass (2006) indicated that interactionists claim, in addition to manipulation of input through interaction, learners need *opportunities to receive corrective feedback* to be able to better regulate language production or output. There are a number of studies in the Second Language Acquisition literature that are based on the interactionist perspectives. Hsu (1994)

interpreted learners' requests for help as a way for learners to overcome the breakdowns in understanding what they experienced when interacting with an aural passage. Liou (1997) used the interactionist account because from her viewpoint, the design of the courseware reflected the interaction negotiation model proposed by Long (1991). As Long (1991) indicated, one of the key components of the interactionist theory is that only the input that is noticed or apperceived can become beneficial. It provides guidance for the design of instructional materials, which should contain features that enhance input through modifications.

Revisiting Ellis' (1999) work on interaction, Chapelle (2003) indentified three types of basic interaction: interpersonal (between people), intrapersonal (within a person's mind), and that which occurs between a person and a computer (learner-computer). Chapelle noted that most users are accustomed to initiate learner-computer interaction when they click on a hypertext link to receive help with comprehension or seek dictionary help. One benefit of learner-computer interaction identified by Chapelle was that of obtaining enhanced input. Chapelle (2003) noted that SLA researchers agree that enrichment of input is more beneficial for learning than simplification because learners are exposed to forms closer to the ones used by native speakers of the language.

Drawing on interactionist SLA theory and Computer-Assisted Language Learning (CALL) research, Chapelle (1999) suggested that interactions in CALL may be beneficial for language development if they focus learners' attention on input form, allow for modification so learners can focus on input form and meaning, and draw learners' attention to the form of their linguistic output in a way that leads to self-correction (Mills, 2000).

Chapelle (1989) asserted that applying the theory and methods of interactionist research to CALL requires an expansion of the conception of negotiation of meaning in two ways. First, negotiation of meaning needs to be seen not only in face-to-face spoken conversations but also in written communication that occurs over networked computers. A second and more extensive expansion of the definition of negotiation of meaning is seen when the modified interaction take place between the learner and the computer. The computer program created the opportunities for modified interaction by offering modified input to the learner on demand. The data documented that the learner actually engaged in modified interactions by requesting and receiving the modified input, i.e., aural repetition and written text (Chapelle, 1989). Theory and research have suggested that the saliency of the target language input (Doughty, 1991; Sharwood Smith, 1991) and opportunities for production of comprehensible output (Swain, 1985; Swain & Lapkin, 1995) are important for acquisition. These claims point to other observable interactions that can be documented in CALL activities, such as whether learners are shown input that highlights relevant linguistic features and whether they correct their linguistic output to make it comprehensible.

Chapelle (1998) stated that a frequently cited research advantage of Computer-Assisted Language Learning (CALL) is the built-in data-collecting methods that can document learners' interaction as they work on learning activities (Bland, Noblitt, Armington, & Gay, 1990; Doughty, 1992; Jamieson & Chapelle, 1987). Chapelle (1998) suggested that such data can provide researchers with detailed information about learners' interactions and performance.

Sociocultural Theory (SCT)

The sociocultural theory (SCT) is a theory under the umbrella term of constructivism. Constructivism is a theory that asserts that humans generate knowledge and meaning from an interaction between their experiences and their ideas. It is an interaction between their experiences and their reflexes or behavioral patterns. Constructivism is not a specific pedagogy, nor a novel concept. It is a basic learning process theory known by educators for years. For constructivists, learning is constructing your own knowledge through *social interaction* with others. It is a process of thinking, and learners figure out knowledge by themselves. When we think of constructivism, we are looking at it in terms of a way that is typically set up in a classroom with groups of students working together, building and sharing. Within the constructivist paradigm, the focus is on the learner rather than the teacher. It is the learner who *interacts* with her or his environment that gains knowledge through this self-learning process.

The Zone of Proximal Development (ZPD) is a theory developed by a prominent psychologist and social constructivist, Lev Vygotsky, stating the difference between what a learner can do without help and what she or he can do with help. Vygotsky stated that a child follows an adult's example and gradually develops the ability to do certain tasks without help or any assistance. Vygotsky (1978) provided the definition of ZPD as the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving with the assistance of an adult (an expert), or through collaboration with more capable peers (novices).

Several CALL researchers see sociocultural theory (SCT) as a potential way to frame and interpret findings in CALL (Levy & Stockwell, 2006; Ganem-Gutierrez, 2003; Warschauer,

2005). Although the current study is based on interactionist theory, the researcher believes that CALL can also be examined through the lens of the sociocultural theory. Cardenas-Claros and Gruba (2009) claimed that framed by socicultural theory, CALL can also be seen from the perspective of the novice-expert account. In this way, CALL could be seen as the *experts* who possess additional information a *novice* may need to understand learning materials. As learners (novices) experience difficulties, they may request additional forms of enhanced input through CALL. Once learners are exposed to different forms of enhanced input, it is likely that they will be able to better perform second language tasks.

Chapelle's (2009) contribution to the relationship between SLA theory and CALL not only updated and expanded the theoretical concerns Garrett raised in 1991 but also provided an expert, in-depth exploration of the issues. Garrett (2009) urged scholars in the field of CALL to remind themselves and those outside the field that "CALL is not shorthand for 'the use of technology' but designates a dynamic complex in which technology, theory, and pedagogy are inseparably interwoven" (Chapelle, 2009, p.719). She argued that the pragmatic goal of Computer-Assisted Language Learning (CALL) developers and researchers to create and evaluate learning opportunities pushes them to consider a variety of theoretical approaches to second language acquisition (SLA), which have developed partly in response to the need to theorize the role of instruction in SLA.

To illustrate connections between SLA and CALL, Chapelle (2009) touched on multiple theoretical perspectives grouped into four general approaches:

1) cognitive linguistic (Universal Grammar, autonomous induction theory, and the concept-oriented approach);

2) psycholinguistic (processibility theory, input processing theory, interactionist theory);
3) human learning (associative-cognitive creed, skill acquisition theory); and
4) language in social context (sociocultural, language socialization, conversation analysis, systemic-functional, complexity theory).

Chapelle (2009) suggested that the above theoretical approaches can be useful in the development and evaluation of CALL materials and tasks. She proposed that the expanding use of technology changes the nature of communicative competence theory, challenges SLA theory, and increases the number of consumers for SLA research. Garrett (1991) referred to the implication for instruction as "Since so complex an ability can hardly be 'taught', our job is to create an environment in class or in our materials in which students can work on acquiring that ability. The power of technology as a medium for supporting new kinds of language learning activities is multiplied by its potential for an unprecedented integration of research and teaching. A CALL lesson which creates an environment for some interesting language learning activity could be fitted with a program collecting data on how the learner makes use of that environment, and those data can not only provide feedback into improving pedagogy but can also contribute to the development of second language acquisition theory" (Garrett, 1991, p.94).

Chapelle (2009) looked at the interactionist theoretical approach as well as the sociocultural theorectical approach to SLA and indicated that interactionist and sociocultural approaches share areas of focus in common because both approaches emphasize the significance of *interaction* in language learning and acquisition.

Developmental Sequences and Grammar Instruction

The issue of whether there are developmental sequences of grammar structures through which all learners of a particular second language must proceed has been one area of increasing interest in SLA research that has been widely explored. This specific issue has been one of the most promising areas of SLA research because it has the potential to show how L2 linguistic accuracy is facilitated by instruction (Nutta, 1996).

Pienemann's (1984) study reported on the influence of formal instruction on L2 acquisition in an instructional experiment. Pienemann found that a structure can only be learned under instruction if the learner's interlanguage has already reached a stage one step prior to the acquisition of the structure to be taught. Pienemann (1984) suggested that the teachability/learnability of L2 structure is constrained by the same processing restrictions that determine the developmental sequences of natural L2 acquisition. Since the processing procedures of each stage build upon the procedures of the preceding stage, there is no way to leave out a stage of the developmental sequence by the means of formal teaching.

Pienemann's (1989) research demonstrated that the teachability/learnability of language is constrained by what the learner is ready to acquire. In other words, Pienemann (1989) investigated whether every learner constructs her or his own grammar and whether L2 teaching is constrained by the course of natural acquisition. He found that students are not able to acquire structures which are beyond their next developmental stage. In fact, if they are taught these structures before they are ready, they often avoid the previously learned structures that are related to them. Pienemann warns against concluding that instruction is not necessary since learners' L2 acquisition can only be promoted when the learner is ready to acquire the given

structures. Pienemann states that teaching can promote acquisition if what is taught is what is learnable at a particular time, i.e., a syllabus should sequence items according to the order in which they are learnable. He also states that SLA research is neutral towards the traditional structural syllabus versus the communicative syllabus because neither is based on psycholinguistic research. Clearly, more research on this topic is warranted, including investigating a broad range of structures as well as conducting research with L2 learners from different L1 backgrounds to measure the effect of negative transfer from the L1.

Ellis (1993) asserted that Pienemann's results point to the necessity of individualized study of grammar structure (ideally, computer-based instruction) that follows a natural sequence but progresses at a pace geared toward each learner (especially if the learners are from diverse L1 backgrounds).

Communicative Language Teaching

Communicative Language Teaching is an approach to foreign or second language teaching which emphasizes that the goal of language learning is to develop students' communicative competence in the target language, or the ability not only to apply grammatical rules of a language in order to form grammatically accurate sentences but also to know when and where to use these sentences (Richards, J. Platt, & H. Platt, 1992). Hymes (as cited in Savignon, 2002) first proposed the term "communicative competence" to represent the appropriate use of language in social contexts. Savignon (2002) defined the term as "the ability of classroom language learners to interact with other speakers, to make meaning, as distinct from their ability to recite dialogues or perform on discrete-point tests of grammatical knowledge" (p.3). Canale and Swain (as cited in Brown, 1994) identified four dimensions of communicative competence:

grammatical competence, discourse competence, social-linguistic competence and strategic competence. Communicative language teaching often entails a student-centered learning environment where students interact and converse in the target language to achieve communicative competence.

Krashen (1985) is one of the most enthusiastic advocates of communicative language teaching. He bases much of his SLA theory on studies of first language acquisition and asserts that the crucial element in learning a new language is comprehensible input. In other words, Krashen believes that learners need to understand the meaning in the second language to be able to acquire the language.

Krashen's (as cited in Nutta, 1996) Monitor Theory includes five hypotheses on how language is learned: a) The Affective Filter Hypothesis – that students cannot learn if their affective needs are not met; b) The Input Hypothesis – that comprehensible input is the essential element in second language acquisition. In order for the student to progress, the teacher must provide input at a level just beyond the student's current level of competence (i +1). This input can be made comprehensible through the use of visuals, through gesturing, through repetition, and many other techniques which are similar to the way that children learning their first language receive comprehensible input; c) The Acquisition/Learning Hypothesis – that fluency in a language is achieved through subconscious processes that occur when the learner is exposed to ample comprehensive input and that learning is a conscious process which allows the student to comprehend rules of the language but to apply them only to situations where there is time for the *monitor* to operate, such as planned speeches and writing; d) The Natural Order Hypothesis – that there is a developmental sequence of structures that are tied to the individual's language

acquisition process. Therefore, if the student is given enough comprehensible input, she or he will be able to learn the structure inherent in the input without any need for grading of the presentation in a syllabus; e) The Monitor Hypothesis – that there is a *monitor* in the brain which evaluates learned structures when there is time for planned speech or writing but which does not affect spontaneous conversation.

Krashen's work has been criticized on many grounds, but one of the most compelling arguments against his theory is its lack of emphasis on interaction and output. Many researchers now stress the importance of negotiation of meaning as well as comprehensible input in the classroom (as cited in Nutta, 1996). Ellis (1985, p.161), a prominent SLA researcher, has consolidated contemporary theory on communicative language teaching, specifically on two of its crucial aspects: input and interaction. He states that the features necessary for facilitation of rapid SLA development are as follows: 1) A high quantity of input directed at the learner; 2) The learner's perceived need to communicate in the L2; 3) Independent control of the propositional content by the learner, e.g., control over topic choice; 4) Adherence to the 'here an now' principle, at least initially; 5) The performance of a range of speech acts by both native speaker/teacher and the learner, i.e., the learner needs the opportunity to listen to and to produce language used to perform different language functions; 6) Exposure to a high quantity of directives; 7) Exposure to a high quantity of *extending* utterances; 8) Opportunities for uninhibited *practice*, which may provide opportunities to experiment using new forms.

Interactionist Theory in Second Language Acquisition (SLA)

According to interactionist approaches to SLA (Hatch, 1978; Long, 1996), interaction is the most important way in which learners obtain data for language learning. In Long's (1996)

Interactionist Hypothesis theory, he claimed that interactive tasks that promote negotiation of meaning among learners can facilitate the development of a second language. Negotiation is often product of interactional exchanges where communication breakdowns take place. Normally the learner receives interactionally modified input, and she or he is also pushed to produce interactionally modified output (Swain, 1985). In this process, learners notice certain input features, and compare them with their own output. Schmidt (1995) claimed that this noticing has to be present for the input to become *intake*. The role of negotiation in these exchanges would be that of allowing conscious noticing (Schmidt, 1995), required to transform input into intake. Research on SLA conducted from a sociocultural framework, especially that originated from Vygotsky (1978) also underscores cooperative learning as paramount to second language acquisition and emphasizes the importance of interaction (Ohta, 2000; Swain, 2000).

Vygotsky, a psychologist and social constructivist, established the foundation for the interactionists' perspectives of second language acquisition. According to Vygotsky (1978), social interaction plays an important role in the learning process. He viewed the Zone of Proximal Development (ZPD) as where learners construct the new language through socially mediated interaction. Although Vygotsky's social-interactionist theory was proposed over 80 years ago, it still serves as a strong foundation for the interactionists' perspectives today (Ariza & Hancock, 2003).

Over the past several decades, while many theories of Second Language Acquisition (SLA) have been proposed by second language researchers, there has been little agreement on any specific SLA theory. Language acquisition theories have traditionally centered on "nurture" and "nature" distinctions, which were advanced by the social-interactionist and nativist camps

respectively. “Social-interactionists see language as a rule-governed cultural activity learned in interaction with others, while nativists perceive language ability as an innate capacity to generate syntactically correct sentences. In other words, interactionists believe environmental factors are more dominant in language acquisition, while nativists believe inborn factors are more dominant” (Shannon, 2005, p.23).

Nativists such as Krashen assume that natural internal mechanisms operate upon comprehensible input which leads to language competence. This is evident in Krashen’s input hypothesis of SLA. Krashen’s input hypothesis was first proposed over 30 years ago, expanding from Chomsky’s Language Acquisition Device. Since that time, many theories have been influenced by Krashen’s input hypothesis (Shannon, 2005).

According to Krashen’s input hypothesis, language acquisition takes place during human interaction in the target language environment. The learner is then exposed to rich comprehensible input in the target language. However, in order for acquisition to occur, the input would need to be slightly beyond the learner’s current level of linguistic competence. Vygotsky put great emphasis on the role of interaction in SLA. Long, among other interactionists, also believed in the importance of comprehensible input. His interaction hypothesis also stressed the importance of comprehensible input as a major factor in second language acquisition; however, he also believed that interactive input is more important than non-interactive input. In addition, Long stressed the significance of interactional modifications which occur in the negotiating meaning when communication problems arise (Ellis, 1994).

The major distinction between interactionist and nativist theories of SLA is that scholars such as Krashen emphasize comprehensible target language input which is one-way input and,

on the contrary, interactionists acknowledge the importance of two-way communication in the target language (Ariza & Hancock, 2003).Interactionists agree that Krashen's comprehensible input is crucial in the language acquisition process, but their emphasis is on how input is made comprehensible (Lightbown & Spada, 1993).

The Interaction Hypothesis

Long believed what makes input comprehensible is modified interaction or negotiation of meaning. In Krashen's input hypothesis, comprehensible input itself remains the main causal variable while Long claimd that a crucial element in the language acquisition process is the modified input that learners are exposed to and the way in which other speakers interact in conversations with learners (Lightbown & Spada, 1993).

Long (as cited in Gass, 2002) investigated conversations between a native speaker (NS) and non-native speaker (NNS) and proposed his interaction hypothesis as follows: "Negotiation for meaning, and especially negotiation work that triggers interactional adjustments by the NS or more competent interlocutor, facilitates acquisition because it connects input, internal learner capacities, particularly selective attention, and output in productive ways" (Gass, 2002, p. 174). In other words, interactional adjustments make input comprehensible, and comprehensible input promotes acquisition, thus interactional adjustments promote acquisition (Lightbown & Spada, 1993). Long believed that when meaning is negotiated, input comprehensibility is usually increased and learners tend to focus on salient linguistic features (Ariza & Hancock, 2003). Carroll (2001) summarized Long's Interaction hypothesis as follows: Speakers in conversations negotiate meaning. In the case of conversations between learners and others, this negotiation would lead to the provision of either direct or indirect forms of feedback,

including correction, comprehension checks, clarification requests, topic shifts, repetitions, and recasts. This feedback draws the learner's attention to mismatches between the input and the learner's output.

Negotiation of meaning leads to modified interaction, which consists of various modifications that native speakers or other interlocutors make in order to render their input comprehensible to learners. For example, native speakers in a conversation with non-native speakers often slow their speech down, speaking more deliberately. Also, native speakers tend to restate information using synonyms (Shannon, 2005).

Krashen viewed comprehensible input as a source of acquisition and asserted that comprehensible input is necessary for language acquisition to occur. However, some researchers argued that comprehensible input is not sufficient to promote acquisition. For example, Swain (1995) advanced her comprehensible output hypothesis which claims that output, in addition to input, is also critical in SLA. She stated that output allows learners to create awareness of language knowledge gaps, experiment with language forms and structures, and obtain feedback from others about language use (Ariza & Hancock, 2003).

Comprehensible output helps learners to notice a *gap* between what they want to say and what they can say, leading them to recognize what they do not know or are forgetting about the target language. Noticing a problem pushes the learner to modify his or her output and in doing so, the learner may sometimes be forced into a more syntactic processing mode (Ariza & Hancock, 2003). For example:

NNS: So, I went to shopping yesterday.

NS: Oh, you went shopping?

NNS: Yes, I went- I went shopping.

From this perspective, not only comprehensible input obtained through interaction is crucial, but also does comprehensible output play an important role in interaction.

Effects of Negotiation in Second Language Acquisition (SLA)

Many researchers agree that interaction enriches the input to the learning mechanisms. According to Long, negotiation of meaning promotes language acquisition to occur Gass (1997) also acknowledges negotiation as a facilitator of learning, and claims that negotiation draws attention to erroneous or inappropriate forms, and also creates a situation in which learners receive feedback through direct and indirect evidence, and, as a result, this facilitates second language learning. Carroll (2001) attempted to clarify possible functions of negotiation of meaning in relation to enhancing of learning and argued that negotiation helps the learner make more precise her or his choice of lexical item, and this might strengthen the learner's encoding of a given form and lead to greater practice, which in turn will enhance recall of the relevant items. She also stated that it is still unclear whether the negotiated interaction can accomplish anything else other than practice. Thus, further research is needed to examine relationships between negotiated input and acquisition that occurs (Shannon, 2005).

Ellis (1994) also noted experimental studies which have attempted to discover whether negotiation leads to interlanguage development and whether modifications help acquisition at least where vocabulary is concerned. He, however, also claimed that there has been no empirical test of the claim that negotiation of meaning aids the acquisition of new grammatical features. In

summarizing findings of empirical studies concerning the relationship between feedback and learner output, Ellis (1994) stated that learners are much more likely to produce output modifications in response to clarification requests than to confirmation requests and repetitions, as clarification requests require learners to produce improved output, instead of native speaker's modeling of what the learner intended to mean.

In addition, pushing learners to produce more comprehensible output may have a long-term effect, but not necessarily for all learners. However, Ellis again noted that there is little hard evidence to support the output hypothesis so far, and it is not clear whether pushed output can result in the acquisition of new linguistic features (Ellis, 1994).

To conclude the above discussion, negotiation of meaning and pushed output are said to have the following effects on second language acquisition: 1) It helps to promote communication; 2) It facilitates learning as it helps noticing a *gap* between received input and the learner's output; 3) It enables learners to receive feedback through direct and indirect evidence Recall of the relevant item will be enhanced; 4) It helps acquisition at least where vocabulary is concerned; 5) Clarification requests facilitate learners to produce output modifications; 6) Pushing learners to produce more comprehensible output may have a long-term effect in language acquisition (Shannon, 2005).

Computer-Assisted Language Learning (CALL)

CALL as a research field has received considerable attention over the past few years, and a number of studies have attempted to identify the characteristics and limitations of research taking place in the field (Stockwell, 2007). CALL is traditionally described as a means of presenting, reinforcing and testing particular language items. The learner is first presented with a

rule and some examples, and then answers a series of questions which test her or his knowledge of the rule and the computer gives appropriate feedback and awards a mark, which may be stored for later inspection for the teacher (Gunduz, 2005).

Gunduz (2005) indicated that even though computers have been used since the first half of the 20th century, they were not used for educational purposes until the 1960s. In the 1970s, the use of CALL evolved in the field of linguistics and language learning. The pioneering projects in CALL, which were referred to as Computer-Assisted Instruction (CAI) was the computer-based introductory courses developed in the U.S. in the 1960s. By the 1980s, people had witnessed the spread of computers both in educational institutions and in households. Since the beginning of the 1980s, computers have been used in many schools, and CALL software has also become more readily available on the market (Ittelson, 2000). CALL is an emerging force in language education. Despite the on-going resistance of many in the field of language teaching, it is maturing and showing that it can be a powerful tool in the hands of experienced teachers (Knowles, 2004). Warschauer and Healey (1998) claimed that the history of CALL can be divided into three stages: behavioristic CALL, communicative CALL, and integrative CALL.

Behavioristic CALL

Behavioristic CALL came into being in the late 1960s and was used widely in the 1970s under the influence of the *Audio-Lingual Method* of language teaching. In this stage of CALL, repetitive language drills were used, and the computer did not allow students to work at an individual pace, which hindered motivation (Warschauer & Healey, 1998).

Communicative CALL

Warschauer and Healey (1998) pointed out that it was during the period of the 1980s that behavioristic approach to language teaching was being rejected at both theoretical and pedagogical level, and personal computers were creating greater possibilities for individual work at school. Communicative CALL corresponded to cognitive theories which stressed that learning was a process of discovery, expression and development. Under the influence of *Communicative Language Teaching*, advocates of communicative CALL argued that computer-based activities should focus more on using forms. Moreover, the focus was not so much on what students did with the computer, but rather what they did with each other while working at the computer.

Interactive CALL

By the 1990s, communicative CALL began to be criticized. New second language acquisition theories and socio-cognitive views influenced many teachers and led them to use more social and learner-centered methods. This time, emphasis was put on language use in authentic social contexts. Task-based, project-based and content-based approaches all sought to integrate learners in authentic environments, and also to integrate the various skills of language learning. In integrative approaches, students are able to use a variety of technological tools as an ongoing process of language learning rather than visiting the computer lab on a weekly basis for isolated exercises (Warschauer & Healey, 1998).

Internet-based CALL

In several studies, the internet has been found to strengthen students' linguistic skills by fostering their overall language learning attitudes (Felix, 2001; Kung & Chuo, 2002; Son, 2008), self-instruction strategies (Dunkel, Brill & Kohl, 2002; Harris, 2003) and self-confidence

(Dooly, 2007; Nga, 2002). Similarly there is evidence that students can improve their perceptions, attitudes and motivation in language learning by using the Internet (Al-Jarf, 2007; Felix, 2001; Lee, 2005).

Research on Computer-Assisted Language Learning (CALL)

The use of technology in language teaching and learning has been the focus of a number of research review studies, including developments in technology and CALL research (Zhao, 2003). In this section of the review of the literature, a number of research studies on CALL were examined and presented in chronological order as follow:

Chapelle and Jamieson (1986) conducted a study to investigate the effectiveness of computer-assisted language learning (CALL) in the acquisition of English as a second language by students whose native language is either Arabic or Spanish in an intensive program. Students' English proficiency was measured by the TOEFL and an oral test of communicative competence. The results of the study showed that the use of CALL predicted no variance on the criterion measures and indicated that some CALL materials may be better suited to certain types of learners than others and it is necessary to consider various learner variables when researching the effectiveness of CALL.

Lasagabaster and Sierra (2003) stated that although several studies have explored the attitudes of teachers and students towards CALL, there has been little research regarding students' insights and impressions. Kessler and Plakans (2001) stated that in the process of evaluating materials "learners must be included, as they are also experts of their learning as well as benefactors of well-developed materials. Lasagabaster and Sierra (2003) undertook a study in which students were given the opportunity to express their opinions about the software they used

in the multimedia laboratory. Participants of the study were 59 undergraduates who completed a questionnaire, and the conclusion was that students clearly see software programs as a complementary tool in the foreign language classroom.

Within the field of Computer-Mediated Communication (CMC), it is also considered that successful implementation of computer-based, interactive, communicative tasks, can yield numerous benefits for L2 learners. De la Fuente's (2003) study examined the differential effects of computer-mediated interactions and face-to-face interactions in the acquisition of L2 word meanings by learners of Spanish. Receptive and productive, oral and written measures were used to assess both task participation and assessment performance. Interactionist, task-based research has recently examined the potential effects of negotiation of meaning on L2 vocabulary development, and the role of pushed output production within the negotiation process (De la Fuente, 2003). Current cognitive psychological knowledge on L2 vocabulary (Ellis, 1995) served as the framework to explain results.

Jamieson, Chapelle, and Preiss (2004) stated that CALL evaluation might ideally draw on principles from the field of second language acquisition. In their study, a subset of criteria were used to evaluate the design of English as a second or foreign language (ESL/EFL) online courses and assessments, *Longman English Online*. Results of the judgmental evaluation indicated that most of the criteria were met, although some better than others.

In Stockwell's (2007) study, literature examining what technologies are used in the teaching of the language skills and areas was reviewed. All empirical research articles appearing in four major English-language journals in the field of CALL (CALICO Journal, CALL, Language Learning & Technology, and ReCALL) from 2001 to 2005 were examined. The study

concluded with a discussion of the relationship between technology and pedagogical goals. With respect to the teaching of grammar, Stockwell (2007) pointed out that studies focusing on grammar generally consisted of the teaching of new grammatical structures or on the improvement of syntactic accuracy or complexity, and were varied in their range and scope. A number of studies had examined the use of commercial courseware applications, such as a study by Jamieson, Chapelle, and Preiss (2004) who investigated the use of *Longman English Online* with adult ESL learners.

In a case study conducted by Kim and Rissel (2008), three language instructors' beliefs about how language teaching and learning affected their use of computers in teaching in a post-secondary context were examined. Data consisted of six weeks of observations of classrooms and computer labs and interviews with the three instructors. The finding suggest that the instructors' belief about interaction affected their use of computer more significantly than their ability to use computer technology and imply that for computers to be more widely used, instructors' belief and approaches to language teaching needs to be taken into consideration.

Tsai and Jenks (2009) conducted a quasi-experimental study to explore the effect of a *Teacher Guided Multimedia* CD-ROM program as a supplement in teaching vocabulary acquisition to EFL students. Students from two intact classes were assigned to the control and the experimental groups for four weeks. The control group received two hours of traditional instruction only. The same instructor taught both groups lessons of identical content. The results indicated the group that used the CD-ROM program achieved better English vocabulary acquisition than the traditional didactic instruction group.

Godwin-Jones (2009) stated that using computers to help students practice and learn grammatical constructions goes back to the earliest days of computer-assisted language learning (CALL). With the coming of the Internet age, CALL began to focus more heavily on the new capabilities of computer-mediated communication. For adult learners, an awareness of forms and rules is a vital component of online learning. Compared with earlier grammar-oriented applications, however, there is recognition today that a focus on form should not be an isolated, stand-alone activity but rather should be integrated into a communication-centered, networked language learning environment. Therefore, it has become clear that grammar exercises need to require more than single word or phrase answers. The older exercise formats, such as multiple choice and fill in the blanks, should be supplemented by new and engaging interactions with real communicative goals. Informative, contextual feedback should accompany the exercises. Godwin-Jones (2009) stated that the expectation today is that programs will guide students to pay attention to forms and structures, and grammar exercises need to be integrated, intelligent, and innovative.

Garrett (2009) explored current uses of technology to facilitate the teaching and assessment of second languages. She discussed the changes that have taken place over the last 18 years regarding selected topics from her 1991 article, including the relationship between technology, pedagogy, theory, research, and etc. Garrett (2009) then explored the most challenging issues facing computer-assisted language learning (CALL) scholarship and practice today, that is, new demands in language education, the need to rethink grammar instruction, online learning, teacher training and professional development, and CALL research. Garrett concluded that new initiatives are needed to promote the use of technology for research on

CALL and for facilitating second language acquisition, such as support for institutional language centers, streamlining of the work of professional organizations dedicated to CALL, and the establishment of a national CALL center.

In Garrett (1991), the efficacy of computer use for enhancing language learning constituted an issue of major concern. Garrett argued then that studies attempting to answer the question were generally misconceived because the use of the computer is not of itself a language teaching method; its efficacy depends overwhelmingly on how it is used; i.e., what language learning activities it supports and how well its use is integrated into the syllabus.

Garrett (2009) stressed in her 1991 article the primacy of pedagogy over technology; today, by contrast, she wanted to emphasize that none of the three major components of CALL, i.e., technology, pedagogy, or research, should dominate the others. The accepted pedagogical practice should not be the primary determiner of technology use. Nor can SLA theory be privileged in shaping CALL, although it undeniably plays a huge role in motivating and justifying it.

Garrett (2009) would see today's CALL in three categories: tutorial, engagement with authentic materials, and communication. Traditional grammar CALL generated corrective feedback by checking students' answers against item-specific stored correct answers. Current initiatives to develop error diagnostics and feedback are focused instead on natural language processing (NLP) or intelligent CALL (iCALL), in which the actual grammar rules of language are programmed into the computer and student input is matched against them using a parser.

The new demands on language education constitute a powerful set of reasons to rethink grammar CALL. Some programs strongly oriented toward the communicative approach still

relegate practically all student work on grammar to outside-of-class activities, referring learners to textbook explanations and assigning form-based drill and practice. Textbook explanations tend to be offered from a structural perspective rather than offering a semantic, communicative, and conceptual basis for understanding the form in question (Garrett, 1982), and workbooks, whether paper or online, still offer mechanical drills. Garrett (2009) indicated that although SLA theorists and teachers have developed new ways to approach the teaching of form, these have not been implemented in CALL.

CALL and Corrective Feedback

It has been argued that corrective feedback plays a beneficial role in facilitating the acquisition of certain L2 grammatical forms, which may be difficult to learn through input alone. Corrective feedback can be used to draw learners' attention to mismatches between the learners' production and the target language forms (Sauro, 2009). Lyster and Ranta (1997) provided categories of corrective feedback as follows: 1) Explicit Error Correction: Explicit provision of the target-like reformulation. For example: You should say visited; 2) Metalinguistic Feedback: Comments, information or questions related to the ill-formedness of the utterance. For example: There's a mistake. It's past tense. Did you use past tense?; 3) Elicitations: A prompt for the learner to reformulate. For instance, Try that again. How do we say that in the past tense? Yesterday we….; 4) Repetitions: Repetition of all or part of the utterance containing the error, often accompanied by a change in intonation. For instance: Yesterday we visit* my aunt; 5) Recasts: Implicit reformulation of all or part of the learner's utterance. For example: Yesterday we visited my aunt; 6) Translations: Target language translation of unsolicited use of the L1; 7) Clarification requests: An utterance indicating a problem in comprehension, accuracy or both.

In looking at the relationship between CALL research and grammar instruction, it is imperative to examine the role of corrective feedback in facilitating the acquisition of L2 grammatical structures through CALL. Because it has been established that corrective feedback is a form of consciousness-raising (Lightbown & Spada 1990; White, Spada, Lightbown, & Ranta 1991), Nagata and Swisher (1995) claim that the computer could provide individualized grammatical consciousness-raising through intelligent corrective feedback. Traditional CALL feedback notifies the user of a missing or incorrect word while intelligent CALL feedback goes beyond simple notification of an error and offers detailed meta-linguistic explanations about the type of error. They cite the definition of consciousness-raising developed by Rutherford and Sharwood-Smith (1985) which suggests that it is a process which argues the salience of underlying structures. Doughty (1991) specifies levels of consciousness-raising, ranging from explicit rule explanations to providing examples that are relevant to a difficult structure. Nagata and Swisher propose that CALL incorporate the full range of consciousness-raising options.

Heift's (2004) study investigated the effects of corrective feedback on learner uptake in CALL. In the study, learner uptake was defined as learner responses to corrective feedback in which, in case of an error, students attempt to correct their mistakes. One hundred and seventy-seven students from three Canadian universities participated in the study during the Spring semester of 2003. The study considered three feedback types: Meta-linguistic, Meta-linguistic + Highlighting, and Repetition + Highlighting. Study results indicated that "Meta-linguistic + Highlighting" feedback which provides an explanation of the error and also highlights the error in the student input is the most effective at eliciting learner uptake.

Kim's (2009) study examined the effectiveness of the types of feedback that vary in its explicitness in a computer-assisted language learning (CALL) environment as well as adaptive methods of feedback delivery based on learners' performance. Both issues were examined within the context of a computer-based tutorial designed to help advanced Korean learners of English reduce overpassivization errors in academic writing. The results suggested that among the types of corrective feedback provided (traditional, prompt, contrastive, and adaptive), the contrastive type of feedback, which contained the target structure, seemed to be the most effective feedback type for increasing the adult Korean ESL learners' ability to recognize and correct overpassivization errors.

Rosselle, Sercu, and Vandepitte (2009) reported on findings obtained from an exploratory study on the effectiveness of feedback in a computer-based online learning environment. Questionnaires and grammar test and delayed posttest data yield insights into the learners' reactions and learning outcomes in relation to the different feedback types. Roselle et al. (2009) found that more explicit feedback, combined with adequate depth of processing, led to better learning outcomes and more positive student perceptions.

Many online grammar exercises also offer interactive feedback that requires students to reflect on their answers. These exercises allow students to understand why their answers are correct or incorrect. Such exercises not only tell students why an answer is right or wrong, but also lead them to a greater understanding of grammatical rules as they are prompted to explore, think and decide on the direction of their own learning (McIsaac, 1999; Milton, 2003). Furthermore, many grammar websites offer supplementary exercises with immediate feedback to

students. This includes negative feedback (Ellis, 2002), which is considered as important in the learning of grammar.

CALL and Second Language Grammar Instruction

CALL Related Research on Grammar Instruction

Liu, Moore, Graham, and Lee (2002) reviewed the literature on computer uses in second and foreign language learning from 1990 to 2000 inclusive. Liu et al. (2002) claimed that given the strong interest in technology use for language learning, it is imperative to examine how computer technology has been used in the field. The two goals of the review of Liu et al. are 1) To understand how computers have been used in the past years to support second and foreign language learning; 2) To explore research evidence with regards to how computer technology can enhance language skills acquisition. Liu et al. (2002) discussed the findings of said review under the following categories: a) Potentials of computer technology and its use in specific areas; b) Software tools used in certain language skill areas; c) Software design considerations; d) Computerized language testing; e) Research findings from studies using quantitative and/or qualitative methodologies. Although Liu et al. had reviewed literature on computer uses in second and foreign language learning from 1990 to 2000, there were a few studies with respect to Computer-Assisted Language Learning (CALL) grammar instruction recorded as follows.

McCarthy (1994) examined the contributions and limitations of computer technology in the presentation of grammar drills, particularly in a second language by comparing and contrasting the new technology with traditional textbook instruction. McCarthy (1994) noted that in many ways, Computer-Assisted Language Learning (CALL) is a derivative form of traditional language teaching, but that CALL has some specific advantages in seven areas: 1) organization

of materials; 2) display of items; 3) volume of materials and random presentation; 4) feedback, scoring and record-keeping; 5) focused tutorial assistance; 6) graphics and animation; 7) cognitive direction.

Nagata (1996) investigated intelligent computer versus workbook grammar instruction utilizing CALL instruction with 26 college Japanese students. The results indicated that computer instruction is more effective for teaching grammatical structures and that intelligent feedback is significant.

Zhao's (1996) study examined ESL directors' attitudes toward Computer-Assisted Instruction (CAI) in American universities and found that some of the directors at the ESL programs believed the computer is presently better suited for ESL for teaching *grammar* and vocabulary than reading and writing. Statistically significant differences were found between and among subgroups. Zhao (1996) distributed a modified version of Menke's 1989 questionnaire to 203 ESL directors with a return rate of 71%. Most of the ESL programs investigated in the study provided CAI. Study results showed that directors with over 100 students more strongly agreed than other groups that computer is a powerful tool for increasing student motivation toward language learning; directors with 50-100 students more strongly agreed than other groups that computer is currently better suited for ESL for teaching *grammar* and vocabulary than reading and writing. In addition, directors with CAI more strongly agreed than those without CAI that computer is a powerful tool for increasing student participation in language learning.

In addition, Nagata (1997) continued to investigate the effects of computer-assisted meta-linguistic instruction to teach grammatical structures by using two programs to test students' use of the Japanese particle with 14 second year college students. The results showed that computer

exercises with meta-linguistic feedback were helpful for students to understand complex grammatical concepts.

Furthermore, Nagata (1998) examined the effectiveness of computer-assisted comprehension practice (input) and production practice (output) on second language acquisition. Fourteen students in a second semester Japanese course in the university were invited to use two programs named Banzai and Honorifics, which were developed in HyperCard by the researchers. The study results indicated that output-focused practice was more effective than input-focused practice for the development of the production of Japanese honorifics and was equally effective for the comprehension of said honorifics.

Nutta (1998) compared the effectiveness of Computer-Assisted Language Learning (CALL) grammar instruction with teacher-directed grammar instruction using the *ELLIS* program with 53 post-secondary English as a Second Language (ESL) students in an Intensive English Program (IEP). The results showed that CALL grammar instruction was reported to be effective and in some cases more effective than teacher-directed grammar instruction for teaching grammar to post-secondary ESL students in an IEP. The CALL instruction group had significantly higher achievement than the teacher-directed group on the open-ended tests. The results indicate that CALL instruction was an effective method of teaching L2 grammar.

Hanson-Smith (1999) claimed that there are various ways to teach grammar and several of them have been adapted for Computer-Assisted Language Learning (CALL). For example, in teaching grammar with a focus on form, the teacher, text, or computer program divides the language into teachable units or grammar points (for example, articles or adjective clauses), presents rules and some examples, and then provides practice exercises. This top-down or

deductive model is perhaps best exemplified in CALL by *Azar Interactive*, which is basically Betty Azar's grammar book in CD-ROM format. One big advantage of the computerized version is that the student *receives corrective responses immediately*. Another advantage is that for students planning to take the TOEFL, this type of exercise most resembles the test. Azar takes the books a step further by including short videos with skits or listening passages with a cartoon prompts that model the grammar point. The student can also listen to the sentences being read, as a kind of listening dictation while clicking on the correct answer. These attempts to put the grammatical points into a *multimedia context* are an interesting way to somewhat bring the grammar to life. The Azar approach is satisfying in its completeness, but students may eventually do well at filling in the blanks while still having lots of trouble using the target structures in their own writing (Hanson-Smith, 1999).

Al-Jarf (2005) conducted a study to examine whether integration of online learning in face-to-face in-class grammar instruction significantly improves EFL freshman college students' achievement and attitudes. Two groups of freshman students participated in the study. Pretest mean scores showed significant differences between the experimental and control groups in their grammatical knowledge. After the online instruction, comparisons of the posttest mean scores showed significant differences in achievement. The study concluded that in learning environments where technology is unavailable to EFL students and instructors, use of an online course from home as a supplement to in-class techniques helps motivate and enhance EFL students' learning and mastery of English grammar.

Chen (2006) conducted a quasi-experimental study to examine whether the CAI (computer assisted instruction) tutorial program had an impact on the EFL (English as a Foreign

Language) grammar skills of the beginning EFL language learners. A post-writing assessment was administered for both the control group and the experimental group after the treatment. One hundred written essays were analyzed through error analysis and data were computed through a one-way ANOVA on overall error rates. The major finding on overall error rates demonstrated that there was no statistically significant difference between the control group and the experimental group.

Ngu and Rethinasamy's (2006) study assessed the effectiveness of using a CALL (Computer-Assisted Language Learning) lesson over a conventional lesson to facilitate learning of English prepositions. Both the conventional and the CALL lessons were matched with the same content except for the medium in which the lesson was being delivered. Students were provided with computers to go through the CALL lesson in a self-regulated manner while a teacher taught the conventional lesson in a classroom. Test results indicated that students who received the conventional lesson outperformed those who went through the CALL lesson. The results also showed that the conventional group learned more efficiently than the CALL group.

Mohamad (2009) conducted a study to compare two grammar instruction modes, i.e., internet-based grammar instruction and conventional pen and board instruction to investigate the validity of the claim that with the use of the internet, language teachers now have at their disposal various learning websites with interactive contents that can be argued to offer certain advantages over conventional classroom setting instruction. His study involved 50 college-level students in Malaysia. The study results indicated that the students who went through the internet-based grammar instruction performed better than those who received conventional pen and board instruction in the learning of certain grammatical items. The findings also indicated that students

who experienced internet-based grammar instruction made fewer errors in their essays as compared to their conventional pen and board instruction counterparts. Mohamad's (2009) study provided empirical support for the claim that the internet is a useful and effective tool in the teaching of grammar.

Review of the Azar Interactive CALL Online Programs

Overcast (2007) stated in his review of the *Fundamental of English Grammar: Interactive* that the program has much to recommend for use with English language learners. From a pedagogical standpoint, the contextualized presentation of grammar forms and a large number of opportunities to practice them is sound. One of the advantages is that users are not bound to the traditional language teaching sequence of presentation, practice, and produce. There is no requirement for users to go through presentations of grammar before attempting exercises. Users are free to skip explanations of grammar completely and pursue a more inductive approach to practice by extrapolating from numerous examples available in the grammar charts. To fit personal learning styles, some users may even choose to adopt a *trial and error* approach, as all of the exercises in the program give users at least one chance to change incorrect answers after the first try. The exercises are, perhaps, the strongest component of the program. The sheer volume and variety of practice opportunities available in the program alone are enough to recommend it as a powerful resource. Exercise types include binary or multiple-choice, fill-in-the-blank, editing/error correction, true-false, partial dictation, modified cloze, and others, and exercises incorporate practice with the language skills of reading, listening, and speaking. Speaking exercises requiring users to record responses to listening prompts may be of particular benefit (both received and actual) to learners, who can choose to listen to model responses by

native speakers before or after providing their own answers, as well as view transcripts of the prompts and model responses in pop-up window. Additionally, many of the exercises integrate different skills such as listening and reading. A place has also been made in the exercises for possible review and expansion of vocabulary, as certain words, names, and phrases are hyperlinked to the glossary. Clicking on a hyperlinked item opens a pop-up window displaying a definition and example of the item in use. Overcast (2007) stated that it should also be noted that the tests at the end of each chapter are quite useful, not only from the standpoint of comprehensive review of the grammar points, but also for corrective feedback and diagnostic purposes. Users can choose to open pop-up windows to see explanations for answers marked as incorrect. Also, upon completing a test, users can view a detailed progress report outlining their achievement with respect to specific grammar points highlighted in the chapter. This feature can serve to highlight weak points or gaps in knowledge that may require further coverage by an instructor or review by a learner using the program independently.

Bouziane (2005) examined *Understanding and Using English Grammar: Interactive,* a computer program designed to teach grammar to upper-intermediate to advanced learners that is based on the series of grammar books with the same title. The presentation-practice-production-evaluation pattern adopted by the *Azar Interactive* program is a feature of the deductive approach to the teaching of grammar. *Understanding and Using English Grammar: Interactive* has the ingredients to be a useful resource for its target users. Its original way of deductively presenting grammar patterns as well as the rich contexts of its practice, production, and testing phases are all conducive to facilitating the learning of grammar. Bouziane (2005) recommended that some improvements might be made, such as introducing concepts using a combination of both

deductive and inductive approaches. The integration of grammar concepts with practice in the different language skills in various lively contexts will certainly create opportunities for learning to occur. Bouziane (2005) stated that the *Azar Interactive* program is versatile in that it can be used for self-study, as a supplement to the book, in a self-access center, or even in a suitably equipped classroom. Its use of animation, audio, and interactive exercises using multimedia tools, make it an innovation that would be difficult to duplicate with paper-based materials.

Summary

This chapter has reviewed the theoretical base of Second Language Acquisition (SLA), Computer-Assisted Language Learning (CALL) as well as Second Language Grammar Instruction. The findings support the use of CALL to enhance students' language learning in general, including reading, writing, *grammar*, listening, and speaking. The existing CALL research conducted mostly yield positive results in all four language skills, i.e., reading, writing, listening, and speaking; however, few studies focused particularly on CALL research and English as a Second Language (ESL) *grammar instruction*. Moreover, the researcher found Nutta's (1996) study conducted in an ESL setting (in Florida) and Mohamad's (2009) study conducted in an English as a Foreign Language (EFL) environment (in Malaysia) that directly compared CALL grammar instruction with conventional classroom teacher-directed grammar instruction. Both studies found some degree of statistically significant difference between the two grammar instruction methods. Specifically Nutta's (1996) study indicated that The CALL group had significantly higher achievement than the teacher-directed group on the open-ended tests, and Mohamad's (2009) study concluded that students who went through the internet-based grammar instruction performed better than those who received conventional pen and board

instruction in the learning of certain grammatical structures. Based upon this review of literature, the researcher determined that the research questions in this present study – Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher-directed classroom setting as compared to ESL students taught by CALL (Computer-Assisted Language Learning) and based on their current English proficiency level (low intermediate, high intermediate, and advanced)? are valid questions for research. Hence the present research added to the existing body of literature had investigated the effectiveness of CALL instruction in comparison with traditional classroom teacher-directed instruction in teaching passive grammatical forms to post-secondary ESL students. Additional research yet needs to be done in this area of research.

CHAPTER THREE: METHODOLOGY

Methods and procedures used in the experiment, including the sample selection, research design, instrumentation, experimental treatments as well as data collection procedures are described in this chapter. The purpose of this study is to compare the effects of CALL grammar instruction with the traditional classroom teacher-directed grammar instruction as measured by students' achievement on multiple-choice, cloze/fill-in-the-blank, and open-ended tests of passive grammatical forms.

Participants – Population and Sample

The population of this study was English as a Second Language (ESL) students enrolled in an Intensive English Program (IEP) in Southeastern United States. The IEP provides English language instruction that helps ESL students enhance their ability to use and understand English as it is spoken, written, and heard in the real world as well as in academic settings. Instruction is skills-based, and main courses include reading, writing, grammar, listening, speaking, and communication skills. Additional courses in TOEFL preparation, oral presentations, business English, accent reduction, and other English language skills are also available.

The purpose of the IEP is primarily to help improve students' English proficiency so that they can use the language more effectively in the real world and pass the TOEFL (Test of English as a Foreign Language) to continue their studies and pursue higher level of education in universities and graduate schools in the United States. In addition, the IEP helps immigrants from all over the world, mostly Spanish speakers from South America, learn the English language, adapt to and blend in the American society. Furthermore, the IEP provides English language programs for international students, offers services that enhance research and

instruction in language learning, and coordinates cultural programs that contribute to multicultural awareness and global education.

Students from over 70 countries have participated since the establishment of the English Language Institute in 1987. The goal of the majority of the students enrolled in the IEP is to pass the TOEFL to enter colleges, universities, or graduate schools in the United States while some of the students enrolled in the IEP aim to improve their English in order to have better performance at work and to adapt to the American society and culture. Three 14-week sessions of intensive English are offered at beginning, low intermediate, high intermediate, and advanced levels. Students study for 5 hours per day from Monday to Friday. Extracurricular activities are offered to enhance students' English proficiency by providing them with more opportunities to practice the language. Students have access to multimedia computer laboratories to complement their classroom instruction. Classes at the IEP are limited to approximately 15 students per class to provide quality learning environment.

All Levels 2, 3, and 4 ESL students who were enrolled in the grammar classes at the IEP during the term of this study were invited to participate. The researcher did not include Level 1 students in the present study not only because Level 1 students are beginning level students but also because the structure of focus examined in this study, i.e., the passive voice is not a form of focus at this level. In other words, the passive voice is not included in the curriculum for Level 1 students at the IEP since in most structural syllabi, it is typically learned at a higher level of proficiency. In addition, according to Pienemann's (1984) theory of developmental sequences and teachability/learnability of L2 structure, it may be beyond their current developmental stage for them to acquire this particular grammatical structure. Students were placed into levels based

on their scores on the standardized placement test, i.e., the paper-based TOEFL (PBT), which was administered to the students prior to beginning the IEP. The placement test score distribution is as follows: *Scores* of the students in *Level 1 range from 216 to 370* (Level 1B range from 216 to 320; Level 1A range from 320 to 370), *Level 2 range from 370 to 430* (Level 2B range from 370 to 400; Level 2A range from 400 to 430), *Level 3 range from 430 to 480* (Level 3B range from 430 to 450; Level 3A range from 450 to 480), and *Level 4 range from 480 to 575 or higher* (Level 4B range from 480 to 510; Level 4A range from 510 to 575 or higher).

The sample used in this study was comprised of 140 students who volunteered to participate at the IEP. There were 39 female students and 83 male students. The majority of the students are from Arabic-speaking countries. The participants of this study are from Saudi Arabia, Libya, Kuwait, Qatar, Iran, Iraq, the United Arab Emirates (U.A.E.), Yemen, Dominican Republic, Colombia, Venezuela, Spain, Brazil, Germany, Russia, Turkey, Taiwan, South Korea, Japan, and China. Amongst the 140 students, 122 students took the pretest, 107 students took the posttest, and only 41 students took the delayed test. By utilizing a *random assignment* procedure with *Research Randomizer* (http://www.randomizer.org/form.htm), 140 ESL students were randomly assigned to either the control group, i.e. the teacher-directed group or the experimental group, i.e. the CALL group.

Amongst the 107 students who took the pretest and posttest, there were 54 students in the teacher-directed group and 53 students in the CALL group. There were 33 students (17 students in the teacher-directed group and 16 students in the CALL group) in the low intermediate Levels 2A1, 2A3, and 2B2. There were 32 students (16 students in the teacher-directed group and 16 students in the CALL group) in the high intermediate Levels 3A1, 3A2, and 3A3. There were 42

students (21 students in the teacher-directed group and 21 students in the CALL group) in the advanced Levels 4B1, 4B2, and 4B3 who took the pretest and posttest (see Table 3.1).

Table 3.1.

Sample Size for Both Groups Who Took the Pretest and Posttest

	Teacher-Directed Group (Control Group)	CALL Group (Experimental Group)	
English Proficiency Level	*n*	*n*	Total *n*
Level 2 Low Intermediate	17	16	33
Level 3 High Intermediate	16	16	32
Level 4 Advanced	21	21	42
Total *n*	54	53	107

Amongst the 40 students who took the pretest, posttest, and delayed test, there were 15 students in the teacher-directed group and 25 students in the CALL group. There were 5 students (2 students in the teacher-directed group and 3 students in the CALL group) in the low intermediate Levels 2A1, 2A3, and 2B2. There were 9 students (2 students in the teacher-directed group and 7 students in the CALL group) in the high intermediate Levels 3A1, 3A2, and 3A3. There were 26 students (11 students in the teacher-directed group and 15 students in the CALL group) in the advanced Levels 4B1, 4B2, and 4B3 who volunteered to participate and took the pretest, posttest, and delayed test (see Table 3.2).

Table 3.2.

Sample Size for Both Groups Who Took the Pretest, Posttest, and Delayed Test

	Teacher-Directed Group (Control Group)	CALL Group (Experimental Group)	
English Proficiency Level	*n*	*n*	Total *n*
Level 2 Low Intermediate	2	3	5
Level 3 High Intermediate	2	7	9
Level 4 Advanced	11	15	26
Total *n*	15	25	40

The Intensive English Program (IEP) was chosen as the site for the study for the following reasons: 1) It uses a sequential and progressive curriculum; 2) Students participate in fifty minutes of grammar instruction per day; 3) All instructors, including graduate teaching assistants as well as experienced teachers, have had graduate level preparation in English as a Second Language (ESL) teaching courses; 4) Student attendance is fairly regular since international students who are on F-1 visa risk deportation for excessive absences.

The researcher recruited participants by visiting their grammar classes and explaining the study to them. They were told that they would be able to volunteer to be randomly assigned to one of two groups: the CALL grammar instruction (experimental) group or their regular classroom teacher-directed grammar instruction (control) group. The researcher explained that the purpose of the study is to have students in the CALL grammar class evaluate an online grammar instruction program named *Azar Interactive*, which was designed by the same publisher, i.e., Pearson Longman, as the Azar Grammar book series that have been used in the grammar classes at the IEP for many years. An informed consent form written in simple English was provided to all volunteers, which explained the study participants' rights and responsibilities.

Design of the Study

This study was conducted using *an experimental research* design and was comprised of two experiments. The independent variable was the method of grammar instruction, i.e., the traditional classroom teacher-directed grammar instruction and the CALL grammar instruction. The dependent variables were scores on three separate criterion-referenced measures of passive grammatical forms. The three measures were multiple choice, cloze/fill-in-the-blank, and open-

ended tests. Moderating variable was the students' level of English proficiency. There were three levels of students participating in the study, including Levels 2, 3, and 4.

In order to address experimental mortality, it was decided that students who would be absent more than one class period out of seven would be considered poor attendees and would be analyzed separately from those who attend classes faithfully. In addition, one of the features of the *Azar Interactive* online program is that it records the number of hours learners spent using the program. Also, to address experimental mortality, it was determined that students who spent less than two hours on the practice exercises and activities on the *Azar Interactive* online courseware would be excluded from the data analysis processes. The average number of hours students spent using the *Azar Interactive* online program was four hours and sixteen minutes. (If the experimental group students didn't miss any lab time, they would have logged a total of three hours and twenty minutes on the program). There is no way to verify the amount of time the control group students spent on the practice exercises in the *Azar* textbook outside of class time.

Instrumentation

The three measures used to operationalize the dependent variables in this study were criterion-referenced multiple choice, cloze/fill-in-the-blank, and open-ended tests. The same test was used as pretest, posttest, and delayed test. The pretest was administered one day prior to beginning the experimental treatment, the posttest was administered on the last (seventh) day of the experimental treatment, and the delayed test was administered two weeks after the posttest. The tests assessed students' achievement on the passive grammatical forms. These test instruments were from the test bank of the *Fundamentals of English Grammar* by Betty S. Azar; and therefore were based on the content of instruction in the teacher-directed group as well as in

the CALL group since the *Azar Interactive* online program covers the exact same content of grammatical structures, charts, and materials as the Azar grammar book. Descriptions of the three criterion-referenced measures were provided as follows:

Multiple-Choice Test. The multiple choice test included eight questions which were scored objectively. Questions were phrased as interrogative statements (questions) and declarative (affirmative) statements. An example of the multiple choice test is provided as follows. See Appendix A for the eight multiple choice questions that were used in this study.

Verbs

Directions: *Please choose the correct answer and write the letter a, b, c, or d in front of each question.*

A: Did Romeo quit his job?

B: I _____ that he took a leave of absence.

a. telling c. have told

b. was told d. tell

Cloze/Fill-in-the-Blank Test. The cloze/fill-in-the-blank test included twelve questions which were scored objectively. Two stories of paragraph length were presented with all of the passive grammatical forms omitted/deleted. There were twelve items on the cloze/fill-in-the-blank test. Students were instructed to write any words that make sense on each blank line. This allowed students to make a choice between the different verb tenses for the passive grammatical forms. An example of the cloze/fill-in-the-blank test is provided as follows. Refer to Appendix B for the twelve cloze/fill-in-the-blank questions that were used in this study.

Passive vs. Active Completion

Directions: *Complete the sentences with the correct forms (active or passive) of the verbs in the parentheses.*

A community meeting (**hold**)_____last night. People (**ask**)_____by community leaders to discuss several issues. But the community (**want**)_____to discuss only one issue: the construction of a supermall. Developers in the audience (**argue**)_____that it would bring jobs to the town. But most people (**say**)_____ it would destroy the small-town feeling of the community. The discussion (**become**)_____ tense. It was clear that more time (**need**)_____ in the future for discussion of this matter.

Open-Ended Test. The open-ended test included five questions, and each was scored on a scale of zero to one; 1) with zero points for using active structure instead of passive voice to complete the sentence; 2) with .25 points for an answer that was correctly formed and used the passive with three or more errors in the sentence, e.g., subject-verb agreement error, verb tenses error, spelling error, etc; 3) with .50 points for an answer that was correctly formed and used the passive with two errors in the sentence; 4) with .75 points for an answer that was correctly formed and used the passive with one error in the sentence; 5) with one point for using correct passive structure to complete the sentence with no error found.

The open-ended test for the passive constructions included questions with prompts for the students to write the correct verb tenses of the passive structure of focus. For instance, the following is an example of the open-ended test. See Appendix C for the five open-ended questions that were used in this study.

Sentence Completion

Directions: *Please complete the following sentences using passive grammatical forms. Use as many words as you would like. Please make sure that your answers use correct grammar and that they make sense. Only one complete sentence for each question is required.*

Example:

_____, I drove him to the CMMS.

Because his car was stolen yesterday, I drove him to the CMMS. **OR**

Because his driver license had been suspended, I drove him to the CMMS. **OR**

Because his vehicle has been towed away by the police, I drove him to the CMMS.

Question 1

_____, I picked her up at the airport.

Internal Consistency or Internal Reliability analyses of the measures were conducted for the open-ended tests. *Cronbach's Alpha* test was run to measure the internal consistency or internal reliability of the five open-ended questions. Cronbach's Alpha was run to examine the pretest only because there were the most participants (n = 122) who took the pretest as compared with the numbers of participants who took the posttest (n = 107) or the delayed test (n = 41). Additionally, there was concern with the testing effect or practice effect for the posttest. The results of the *Reliability Statistics* showed that Cronbach's Alpha = .89, suggesting very good internal consistency or internal reliability for the five items on the open-ended tests.

A *Pearson Product-Moment Correlation Coefficient* test was conducted to examine the *Inter Rater Reliability* since there were two raters for the open-ended questions on the pretest, posttest, and delayed test. The five questions of each open-ended test were scored on a scale of

zero to one. The grading criteria for the open-ended, i.e. sentence completion test are as follows: 1) Students must use "passive structure" to be able to receive any credits in this section, i.e., "Be + Past Participle"; 2) If the "Be + Past Participle" structure does not appear in the sentence, zero points will be awarded. In other words, if a student uses "active structure" to complete the sentence, the student will receive zero points for that sentence; 3) If the "Be + Past Participle" structure appears in the sentence, it makes sense, and no errors are found, full credit (one point) will be awarded; 4) If the "Be + Past Participle" structure appears in the sentence, it makes sense, and one error is found, partial credit (.75 points) will be awarded; 5) If the "Be + Past Participle" structure appears in the sentence, it makes sense, and two errors are found, partial credit (.50 points) will be awarded; 6) If the "Be + Past Participle" structure appears in the sentence, it makes sense, and three or more errors are found, partial credit (.25 points) will be awarded. The "error types" could include subject-verb agreement error, verb tenses error, spelling error, etc. Examples of errors are as follows: a) <u>They lost their luggage</u> before they arrived in Orlando. (active structure used; zero points awarded); b) In order to travel around the world, <u>English should [be]* known.</u> (one error found in the sentence; .75 points awarded); c) <u>Because her car is* hit [by]* a truck</u>, I picked her up at the airport. (two errors found in the sentence; .50 points awarded); d) To enter a movie theater, <u>has* [counts as two errors – has in the wrong position in the phrase and is in the wrong form/conjugation] the tickets to be baught.</u>* (three or more errors found in the sentence; .25 points awarded). The researcher and the other rater scored the tests without reference to students' identification or group status, i.e., teacher-directed grammar instruction group or CALL grammar instruction group.

The *Pearson Product-Moment Correlation Coefficient* test was run to establish the *Inter Rater Reliability* through computing the correlation of the scores provided by Rater 1 and Rater 2. The computed Pearson correlation coefficient *r* was .999. Correlation is significant at the .01 level, two-tailed. The result $r = .999$ (n = 122), $p < .001$ indicates that there was a statistically significant, positive, and strong relationship between the open-ended test scores rated by Rater 1 and Rater 2.

CALL Grammar Instruction Group. Students in the CALL grammar instruction group received Computer-Assisted Language Learning grammar instruction from the *Azar Interactive* online program named *Fundamentals of English Grammar Interactive*. The researcher was the lab assistant for the CALL group. The researcher also asked another instructor at the IEP to help monitor and assist with the CALL grammar instruction group. Because the researcher served as the lab assistant in the CALL group, every effort was made to minimize researcher bias that might influence the results of the experiment. The researcher and the other instructor in the CALL grammar instruction group avoided answering any questions from the CALL group students that were pertinent to the content of instruction or that pertained to the grammatical structures, i.e., the passive grammatical forms they were learning. In other words, every attempt was made to minimize researcher bias by only answering students' questions that are related to technical problems of using the *Azar Interactive* online program. Both the researcher and the other instructor refrained from acting as an instructional figure.

Half of the CALL grammar instruction group used computers in the IEP's Multimedia Laboratory (Room 122). There are 32 computers in the lab. Each student had her or his own computer to work on the *Azar Interactive* online program. The Multimedia Lab is fully equipped

with the latest technology. All the computers run the latest version of Microsoft Windows 7 Professional (64-bit). The specifications of the computers are as follows: Students used the HP Compaq dx2450 Microtower PC (KA546UT) with Compaq S1922 18.5-inch widescreen LCD monitor, genuine Windows Vista Business 32 operating system, and standard memory of 2GB. The internal hard disk drive is 80 GB, and the hard disk drive speed is 7200 rpm. The CD-ROM and DVD is 48X SATA DVD/CD-RW combo.

The other half of the CALL grammar instruction group used computers in the IEP's Computer Laboratory (Room 119). There are 25 computers in the lab. Every student had her or his own computer to work on the *Azar Interactive* online program. The Computer Lab is fully equipped with the latest technology. All the computers run the latest version of Microsoft Windows 7 Professional (64-bit). The specifications of the computers are as follows: Students used the HP Pavilion All-In-One MS218 Desktop PC. The computers are equipped with 18.5" LCD display monitor, a base processor of Athlon X2 (B) 3250e 1.5 GHz (22W), and memory of 2GB with 4 GB (2 x 2 GB) (32-bit OS) maximum allowed. The speed is PC2-6400 MB/sec. The hard drive is 250 GB SATA 3G (3.0 Gb/sec) and 7200rpm. The Wireless LAN is 802.11 b/g mini-card.

All the computers in both laboratories are equipped with integrated high definition audio. There are 2 USB, 1 headphone, and 1 microphone, 2W internal speakers, and web camera on each computer. The keyboard is HP USB keyboard and the mouse is HP USB optical mouse. Both of IEP's Multimedia Lab (Room 122) and Computer Lab (Room 119) are fully equipped with the latest technology so that students in the CALL grammar instruction group were able to use and access the *Azar Interactive* online program smoothly and without any problems.

The researcher selected the *Azar Interactive* software program because all of the content charts and grammar points presented in the software are identical to those presented in the Betty Azar's grammar series, *Fundmentals of English Grammar.* The Azar Interactive online program named *Fundmentals of English Grammar Interactive* from the Azar's grammar series is basically Betty Azar's grammar book in online software format. In addition to the notable feature of the program being capable of recording the number of hours learners spent on using the program in the practice activities' grade book report, it combines instruction and practice in one program. Some of its other noteworthy features include 1) Animated grammar presentations, which presents lively, animate "talking heads" to inform students about grammar and usage; 2) Development of structure awareness, which include introductory dialogs that illustrate how grammar works by highlighting use of forms; 3) Extensive grammar practice that provides more than 500 new interactive exercises with dynamic practice in listening, speaking, and reading; 4) Learner support that includes pop-up notes, grammar charts with clear examples, and explanations of key points which provide easy access to information; 5) Ongoing assessment that provides immediate feedback in practice exercises, chapter tests, and progress reports allow students to monitor their own progress. *Azar Interative* Online Courseware took advantage of everything multimedia has to offer, including pictures, movement, color, sound, words, and interactivity. The online software exploits the medium for teaching purposes, and more importantly, to create online programs that are fun as well as instructive (Azar, 2009).

In teaching grammar with a focus on form, *Azar Interactive* online courseware uses a top-down or deductive model by dividing the English language into several teachable units or grammar points, such as conditional and adjective clauses. It presents rules and some examples

first, and then provides practice exercising following the explanation of the grammar points. One big advantage of the computerized version is that the students can receive corrective feedback immediately. In addition, it is advantageous for students planning to take the paper-based TOEFL (PBT) because the format of the exercise resembles the test (Hanson-Smith, 1999).

Teacher-Directed Grammar Instruction Group. Students from nine classes, ranging from Levels 2, 3, and 4 were participants in this experimental study. By utilizing a *random assignment* procedure with *Research Randomizer* (http://www.randomizer.org/form.htm), 140 ESL students were randomly assigned to either the experimental group, i.e. the CALL group or the control group, i.e. the teacher-directed group. The researcher and all the instructors administered the criterion-referenced pretest to all students in both groups prior to the beginning of the experimental treatment. The researcher developed an administration guide which she used when administering the pretest, posttest, and delayed test.

The classes of the teacher-directed group were held in classrooms without any type of computer equipment and instructional technology. The IEP program used the Betty S. Azar's grammar series, *Fundamentals of English Grammar*. The syllabus of the *Fundamentals of English Grammar* series is structural, i.e., the main point of each lesson is to present, explain, and practice the grammar point. There were a variety of activities which attempt to contextualize the structure and provide practice exercises. The *Fundamentals of English Grammar* textbook follows a consistent format, with a preview text, an introduction of the grammatical structure, explanatory grammar notes, written exercises, conversation practice activities, and application activities with graphics, and concluding small group and paired conversation activities.

Although there were different instructors with individual variations in instruction in general, the methodology used by the instructors in the teacher-directed grammar instruction group as observed by the researcher was as follows: At the beginning of the class, the teacher checked attendance and asked students to turn in their homework, which was done fairly quickly. Teacher went over the homework assignments from the previous day, starting by calling out the student's name. (Normally, the teacher assigned homework to specific students in the previous class by writing down their names on the whiteboard.) Students seemed to be quite accustomed to this, as if it was a well-established routine for them to do in class. The teacher continued to call out students' names. Students then presented the answers to the assigned homework orally or wrote the answers on the whiteboard. The students took turns presenting their homework assignments. Students appeared to be receptive to this activity because they were familiar with the way their teacher checked their homework. The teacher began to teach students the grammar point of the day by using the overhead transparencies and/or PowerPoint presentation and by writing down the grammatical structure on the whiteboard. Students could see the form of focus clearly both on the whiteboard and on the overhead transparencies and/or PowerPoint. The teacher asked students to do the exercises in the textbook to practice the structure they just learned in class. These immediate feedback exercises appeared to be successful. The teacher gave students the correct answers to the exercises by reading the entire sentence out loud. The teacher also asked the class to read the sentences with her/him. The teacher assigned homework for the following day by writing down the homework assignment on the whiteboard. The teacher followed a deductive approach to grammar instruction followed by additional opportunities for practice and reinforcement.

All Grammar classes had met for six days for the experimental study. The Grammar 4B1, 4B2, and 4B3 class met from 10:00 a.m. to 10:50 a.m. The Grammar 3A1, 3A2, and 3A3 class met from 11:00 a.m. to 11:50 a.m. The Grammar 2A1, 2A3, and 2B2 class met from 12:00 a.m. to 12:50 p.m. (A Friday before the experimental treatment and Monday through Friday of one week) with the first day (Friday) devoted to completing the pretest and the last, i.e., the sixth day (Friday) devoted to completing the posttest, and a delayed test was administered two weeks after the posttest.

Summary of Procedures

This study was conducted using *an experimental research* design for the quantitative component and was comprised of two experiments. The *independent variable* was the method of grammar instruction (*nominal level* of measurement), i.e., CALL grammar instruction and traditional classroom teacher-directed grammar instruction. The *dependent variables* were scores on three separate criterion-referenced measures of the passive grammatical forms (*interval level* of measurement). The three measures were multiple choice, cloze/fill-in-the-blank, and open-ended tests. The moderating variable was students' level of English proficiency.

Prior to the first day of the experiment, study participants in the CALL grammar instruction group attended an one-hour training session which explained the use of *Azar Interactive* online grammar instruction program. Level 4 students attended class from 10:00 a.m. to 10:50 a.m. Level 3 students attended class from 11:00 a.m. to 11:50 a.m. Level 2 students attended class from 12:00 p.m. to 12:50 p.m. Upon arriving at the lab, students signed in and logged onto the *Azar Interactive* online program. The researcher kept a daily log of events, with

careful attention given to technical problems, and student questions and difficulties pertaining to the use of the program.

The *Azar Interactive* CALL program's feature of recording number of hours learners spent on using the program in the learner's practice activities grade book report proved very useful for this study. In order to address experimental mortality, it was decided that students who spent less than two hours on the practice exercises and activities on the *Azar Interactive* online courseware would be excluded from the processes of data analysis. As noted previously, the average number of hours students spent using the *Azar Interactive* online program was four hours and sixteen minutes. Chapelle (1998) stated that a frequently cited research advantage of Computer-Assisted Language Learning (CALL) is the built-in data-collecting methods that can document learner's interaction as they work on learning activities (Bland, Noblitt, Armington, & Gay, 1990; Doughty, 1992; Jamieson & Chapelle, 1987). She suggested that such data can provide researchers with detailed information about learners' interactions and performance. Therefore, the researcher kept a record of the number of hours learners spent on using the program, saved, and printed out the learner's report for every student in the CALL group to remind them how many hours they had spent learning the passive structures using the *Azar Interactive* online program.

The researcher interviewed 3 students from each level in the experimental group at the end of the experimental study when they completed their delayed tests, i.e., a student whose grades were in the bottom 1/3, another in the middle 1/3, and one in the top 1/3 of each level; therefore, a total of 9 students were interviewed. There were no audio or video recording of research participants during the conduct of the research.

The researcher conducted an ethical study compliant with the Institutional Review Board (IRB) guidelines. The researcher had completed the IRB's Collaborative Institutional Training Initiative (CITI) training and received approval, and notified participants that they would be participating in a research study. An informed consent form written in simple English was given to all volunteers, which explained the study participants' rights and responsibilities.

CHAPTER FOUR: DATA ANALYSIS AND RESULTS

The statistical procedures used in the study, the results of the mixed design repeated measures factorial MANOVA (mixed between-within subjects multivariate analysis of variance) as well as the descriptive statistics for the research questions addressed in this study are described in this chapter.

Statistical Procedures

Two mixed design repeated measures factorial MANOVAs were conducted to analyze the data in order to examine the possible differences in students' achievement on the three measures between the traditional teacher-directed grammar instruction group and the CALL grammar instruction group. Mixed between-within subjects MANOVA was chosen because grammar instruction method and students' English proficiency level were between-subjects variables, and time of observation was a within-subjects variable, and there were three performance measures (multiple choice, cloze/fill-in-the-blank, and open-ended tests). The mixed design repeated measures factorial MANOVA looked at the changes in study participants' performance over time.

Research Questions

The research questions of this study were:

1. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher directed classroom setting as compared with ESL students taught by CALL (Computer-Assisted Language Learning)?
2. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher directed classroom setting as

compared with ESL students taught by CALL (Computer-Assisted Language Learning) based on their current level of English proficiency (low intermediate, high intermediate, and advanced level)?

Quantitative Study Component - Two Mixed Design Factorial MANOVAs

A total of 122 study participants took the pretest, 107 participants took the posttest, and only 41 participants took the delayed test. Among the 41 participants who took the delayed test, there was one participant who did not take the posttest. Because that specific participant was excluded from the data analyses, there were only 40 participants who completed all three tests (the pretest, posttest, and delayed test) in the present study. Because the relatively small sample size for the delayed test due to instructors' little or no inclination to administer the test to the students at the Intensive English Program (IEP), the researcher only received 41 completed delayed tests. Therefore, the researcher decided to label the experiment for which 107 students took both the pretest and posttest as *Experiment 1* and label the experiment for which only 40 students took all three tests (the pretest, posttest, and delayed test) as *Experiment 2.* Although data in the two experiments were analyzed separately, it must be noted that because the test scores in *Experiment 2* were also used in *Experiment 1*, the two experiments were not independent of each other.

Sample size for each level in both teacher-directed grammar instruction group and the CALL grammar instruction group who took the pretest and posttest (*Experiment 1*) was shown in Table 4.1. Sample size for each level in both teacher-directed group and the CALL group who took the pretest, posttest, and delayed test (*Experiment 2*) was shown in Table 4.2. There were only 5 students (2 students in the teacher-directed group and 3 students in the CALL group) in

Level 2. There were 9 students (2 students in the teacher-directed group and 7 students in the CALL group) in Level 3. It must be noted that the sample size *n* decreased over time and got very small in the delayed test in *Experiment 2*; therefore, for Levels 2 and 3 students specifically, because the sample size *n* became too small, *n* = 5 and 9 respectively, it is not appropriate to draw any conclusion about these two levels from the results of *Experiment 2*.

Table 4.1.

Sample Size for Both Groups Who Took the Pretest and Posttest

	Teacher-Directed Group (Control Group)	CALL Group (Experimental Group)	
English Proficiency Level	*n*	*n*	Total *n*
Level 2 Low Intermediate	17	16	33
Level 3 High Intermediate	16	16	32
Level 4 Advanced	21	21	42
Total *n*	54	53	107

Table 4.2.

Sample Size for Both Groups Who Took the Pretest, Posttest, and Delayed Test

	Teacher-Directed Group (Control Group)	CALL Group (Experimental Group)	
English Proficiency Level	*n*	*n*	Total *n*
Level 2 Low Intermediate	2	3	5
Level 3 High Intermediate	2	7	9
Level 4 Advanced	11	15	26
Total *n*	15	25	40

In order to answer both research questions in this study, the researcher ran two mixed design repeated measures factorial MANOVAs, one for *Experiment 1* (n = 107) with two time conditions (pretest and posttest) and the other for *Experiment 2* (n = 40) with three time conditions (pretest, posttest, and delayed test). Each MANOVA compared the main effects and interactions for grammar instruction method, time, and proficiency level for three measures.

Research Question 1 – Experiment 1: Looking at Pretest and Posttest

No students missed more than one class session in both the teacher-directed group and the CALL group. All students were included in the data analyses regardless of their attendance to maintain the sample size (n = 107) because among the 122 students who took the pretest, only 107 students took the posttest.

The mixed design repeated measures factorial MANOVA was conducted to assess the impact of the experimental treatment on participants' performance on the three measures, i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests over time.

Interpretation of the Results

Interpretation of the Multivariate Statistics

First of all, Wilks' Lambda (Λ) test suggested that the two-way time by treatment interaction (Time * Treatment interaction) was not statistically significant, $\Lambda = .962$, $F(3, 99) = 1.303$, $p = .278$ (see Table 4.3). Additionally, Wilks' Lambda test indicated that the main treatment effect comparing the two types of instruction method, i.e., teacher directed and CALL grammar instruction was not significant, $\Lambda = .957$, $F(3, 99) = 1.467$, $p = .228$, suggesting there was no statistically significant difference in the effectiveness of the two teaching approaches. There was, however, a substantial main effect for time. In other words, there was a statistically significant difference in students' performance on the three measures, $\Lambda = .512$, $F(3, 99) = 31.452$, $p < .001$, with both groups showing an increase in scores from pretest to posttest (see Table 4.3).

Table 4.3.

Experiment 1 – Multivariate Statistics for Time and Treatment Effect

Effect	Wilks' Lambda	*F*	Hypothesis df	Error df	*p*
Time * Treatment	.962	1.303	3	99	.278
Treatment	.957	1.467	3	99	.228
Time	.512	31.452	3	99	< .001

Interpretation of the Univariate Statistics

As stated above, there was a statistically significant difference in students' performance on the three measures from pretest to posttest, $\Lambda = .512$, $F(3, 99) = 31.452$, $p < .001$.

The univariate statistics below showed that there was a statistically significant difference in the multiple choice test score, $F\ (1, 101) = 54.176$, $p < .001$, in the cloze/fill-in-the-blank test score, $F\ (1, 101) = 29.840$, $p < .001$, and in the open-ended test score, $F\ (1, 101) = 27.056$, $p < .001$ from pretest to posttest (see Table 4.4).

Table 4.4.

Experiment 1 – Univariate Statistics: *F* Statistics for Time Effect

Source	Measure	*F*	df	Error df	*p*
Time	Multiple Choice	54.176	1	101	< .001
	Cloze/Fill-in	29.840	1	101	< .001
	Open-Ended	27.056	1	101	< .001

There was an increase in score in the multiple choice test (The scale went from 0.00 to 8.00. The teacher-directed group's mean went from 5.22 to 6.26, and the CALL group's mean went from 5.25 to 6.40) (see Table 4.5 and Figure 4.1), in the cloze/fill-in-the-blank test (The scale went from 0.00 to 12.00. The teacher-directed group's mean went from 8.87 to 9.43, and the CALL group's mean went from 8.15 to 9.26) (see Table 4.5 and Figure 4.2), and in the open-ended test (The scale went from 0.00 to 5.00. The teacher-directed group's mean went from 1.89

to 2.40, and the CALL group's mean went from 1.42 to 2.28) (see Table 4.5 and Figure 4.3) from pretest to posttest.

Table 4.5.

Experiment 1 – Descriptive Statistics: Sample Size, Mean, and Standard Deviation

		Teacher-Directed (Control)		CALL (Experimental)	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*
Multiple Choice	Pretest	54	5.22(2.25)	53	5.25(2.24)
	Posttest	54	6.26(1.73)	53	6.40(1.57)
Cloze/Fill-in	Pretest	54	8.87(2.67)	53	8.15(2.62)
	Posttest	54	9.43(2.05)	53	9.26(2.31)
Open-Ended	Pretest	54	1.89(2.03)	53	1.42(1.74)
	Posttest	54	2.40(2.01)	53	2.28(1.88)

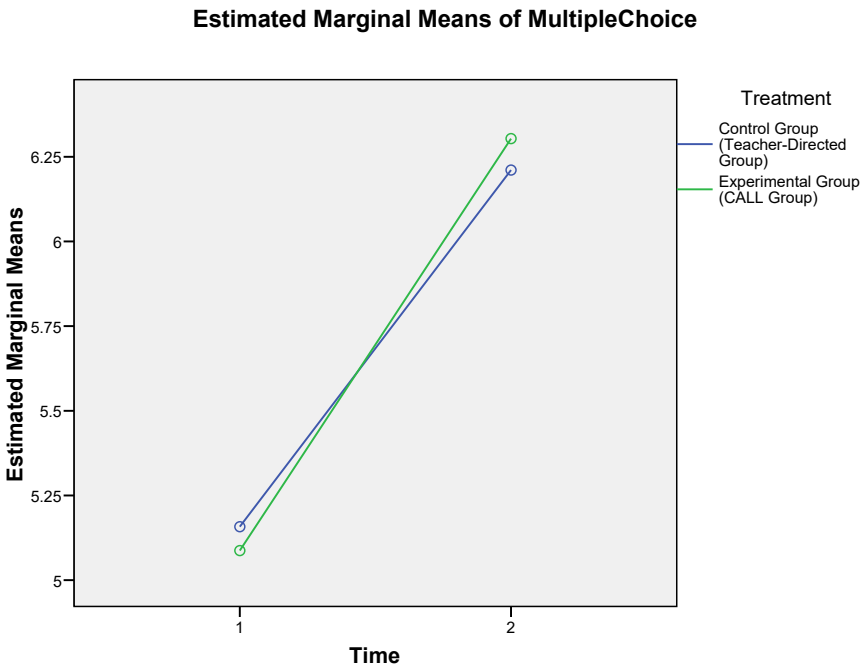


Figure 4.1. Experiment 1 – MANOVA for Time Effect on Multiple Choice Test

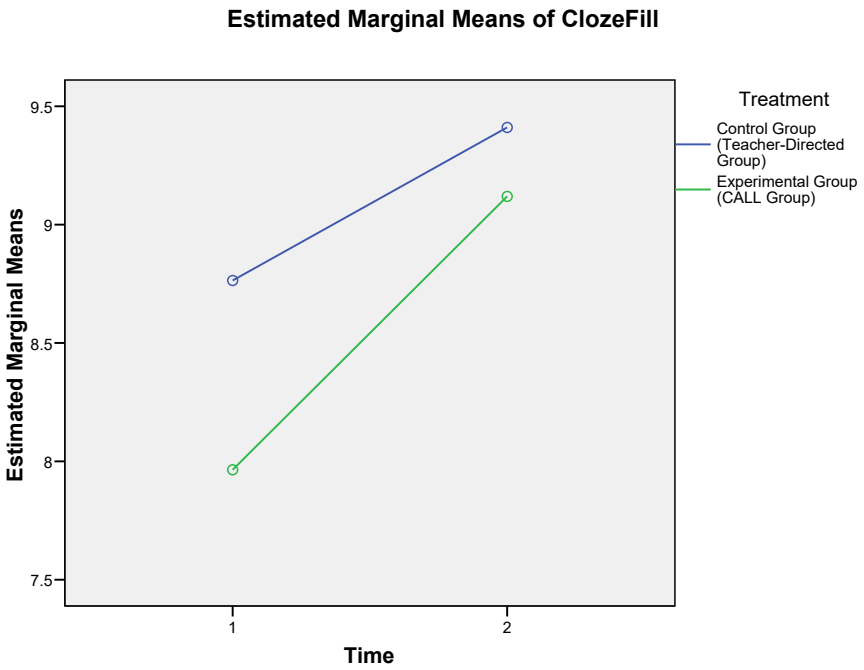


Figure 4.2. Experiment 1 – MANOVA for Time Effect on Cloze/Fill-in Test

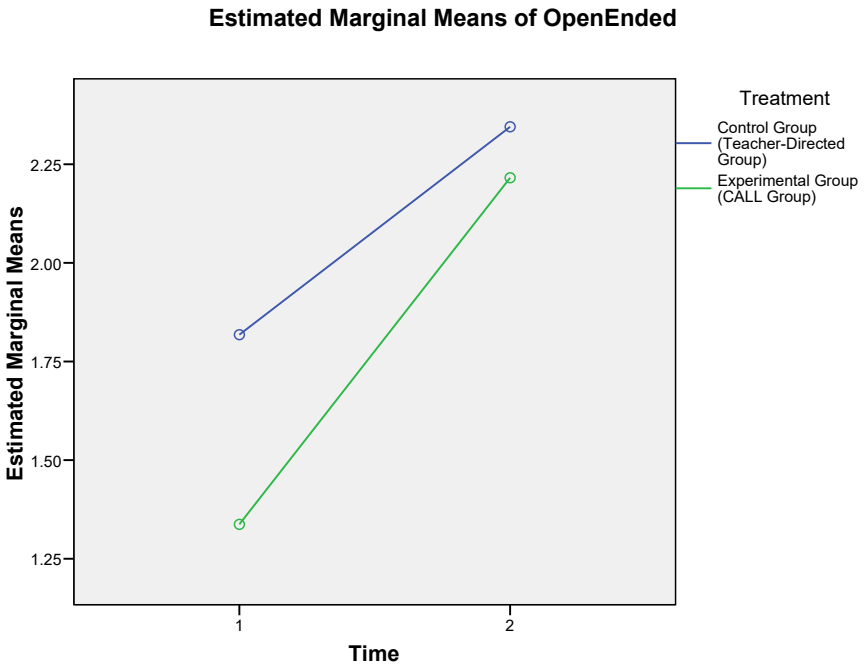


Figure 4.3. Experiment 1 – MANOVA for Time Effect on Open-Ended Test

Research Question 1 – Experiment 2: Looking at Pretest, Posttest, and Delayed Test

No students missed more than one class session in both the teacher-directed group and the CALL group. All students were included in the data analyses regardless of their attendance because of the small sample size of the delayed test (n = 40).

The mixed design repeated measures factorial MANOVA was conducted to assess the impact of the experimental treatment on participants' scores on the three measures, i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests over time.

Interpretation of the Results

For each of the levels of between-subjects variable, the pattern of inter-correlations among the levels of the within-subjects variable should be the same. This assumption was tested as part of the analysis, using Box's M statistic. Because this statistic is very sensitive, a more conservative alpha level of .001 should be used. The statistic was not significant here, i.e., the probability level (p = .068) was greater than .001; therefore, the assumption of homogeneity of inter-correlations has been met.

Interpretation of the Multivariate Statistics

First of all, Wilks' Lambda (Λ) test suggested that the two-way time by treatment interaction (Time * Treatment interaction) was not statistically significant, Λ = .673, $F(6, 29)$ = 2.347, p = .057 (See Table 4.6). In addition, Wilks' Lambda test indicated that the main treatment effect comparing the two types of instruction method, i.e., teacher-directed and CALL grammar instruction was not statistically significant, Λ = .981, $F(3, 32)$ = .212, p = .888 (See Table 4.6). There was, however, a substantial main effect for time, Λ = .360, $F(6, 29)$ = 8.608, p < .001, which indicated there was a statistically significant difference in students' performance

over time on the three measures i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests from pretest to posttest and to delayed test.

Table 4.6.

Experiment 2 – Multivariate Statistics for Time and Treatment Effect

Effect	Wilks' Lambda	*F*	Hypothesis df	Error df	*p*
Time * Treatment	.673	2.347	6	29	.057
Treatment	.981	.212	3	32	.888
Time	.360	8.608	6	29	< .001

The univariate statistics make the assumption of sphericity. The sphericity assumption requires that the variance of the population difference scores for any two conditions are the same as the variance of the population difference scores for any other two conditions. As indicated by the *p* value of .661, .567, .886 in the box labeled Mauchly's Test of Sphericity (see Table 4.7), all of which was not significant (*p* value was greater than .05); therefore, the assumption of sphericity has not been violated.

Table 4.7.

Mauchly's Test of Sphericity

Within Subject Effect	Measure	Mauchly's W	df	*p*
Time	Multiple Choice	.975	2	.661
	Cloze/Fill-in	.966	2	.567
	Open-Ended	.993	2	.886

Interpretation of the Univariate Statistics

As stated above, there was a statistically significant difference over time in students' performance on the three measures, $\Lambda = .360$, $F(6, 29) = 8.608$, $p < .001$.

The univariate statistics below showed that there was a statistically significant difference across three time periods in the multiple choice test score, $F(2, 68) = 23.675$, $p < .001$, in the

cloze/fill-in-the-blank test score, F (2, 68) = 3.368, p = .040, and in the open-ended test score, F (2, 68) = 6.380, p = .003 (see Table 4.8).

Table 4.8.

Experiment 2 – Univariate Statistics: *F* Statistics for Time Effect

Source	Measures	*F*	df	Error df	*p*
Time	Multiple Choice	23.675	2	68	< .001
	Cloze/Fill-in	3.368	2	68	.040
	Open-ended	6.380	2	68	.003

There was a statistically significant difference in score in the multiple choice test (The scale went from 0.00 to 8.00. The teacher-directed group's mean went from 4.53 to 6.47 and to 6.00, and the CALL group's mean went from 5.20 to 6.24 to 6.64) (see Table 4.9 and Figure 4.4), in the cloze/fill-in-the-blank test (The scale went from 0.00 to 12.00. The teacher-directed group's mean went from 9.20 to 9.07 and to 9.18, and the CALL group's mean went from 8.34 to 9.45 and to 9.93) (see Table 4.9 and Figure 4.5), and in the open-ended test (The scale went from 0.00 to 5.00. The teacher-directed group's mean went from 1.77 to 2.17 and to 2.32, and the CALL group's mean went from 1.58 to 2.00 and to 2.40) from pretest to posttest and to delayed test (see Table 4.9 and Figure 4.6).

Table 4.9.

Experiment 2 – Descriptive Statistics: Sample Size, Mean, and Standard Deviation

		Teacher-Directed (Control)		CALL (Experimental)	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*
Multiple Choice	Pretest	15	4.53(2.17)	25	5.20(2.27)
	Posttest	15	6.47(1.60)	25	6.24(1.83)
	Delayed	15	6.00(2.14)	25	6.64(1.11)
Cloze/Fill-in	Pretest	15	9.20(2.28)	25	8.34(2.77)
	Posttest	15	9.07(2.23)	25	9.45(2.31)
	Delayed	15	9.18(2.30)	25	9.93(1.95)
Open-Ended	Pretest	15	1.77(1.88)	25	1.58(1.58)
	Posttest	15	2.17(1.74)	25	2.00(1.72)
	Delayed	15	2.32(2.04)	25	2.40(1.77)

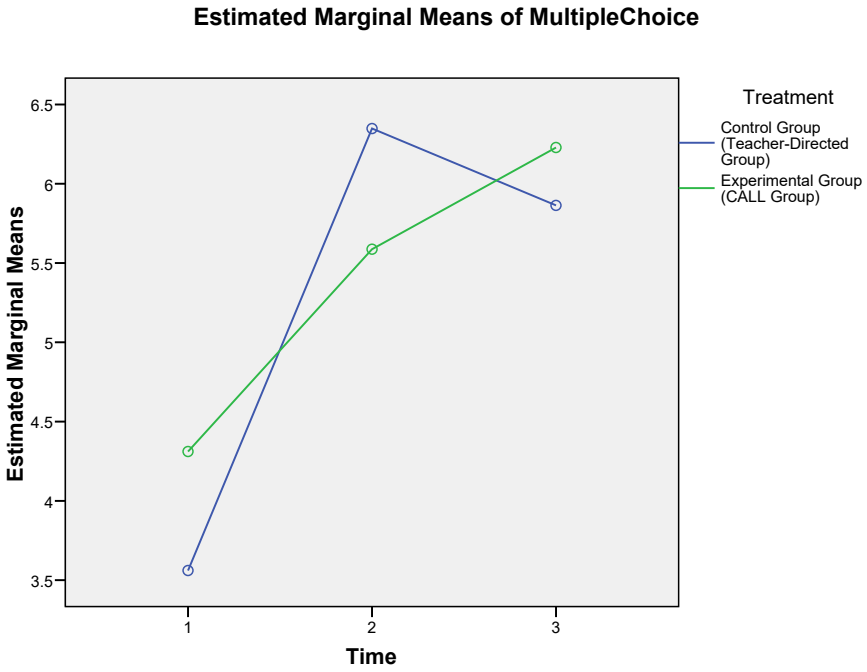


Figure 4.4. Experiment 2 – MANOVA for Time Effect on Multiple Choice Test

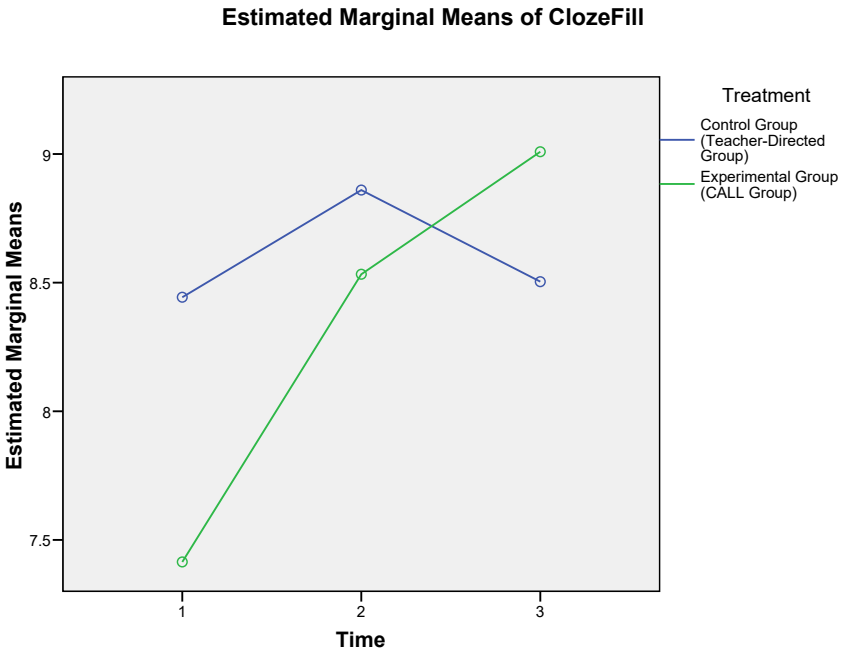


Figure 4.5. Experiment 2 – MANOVA for Time Effect on Cloze/Fill-in Test

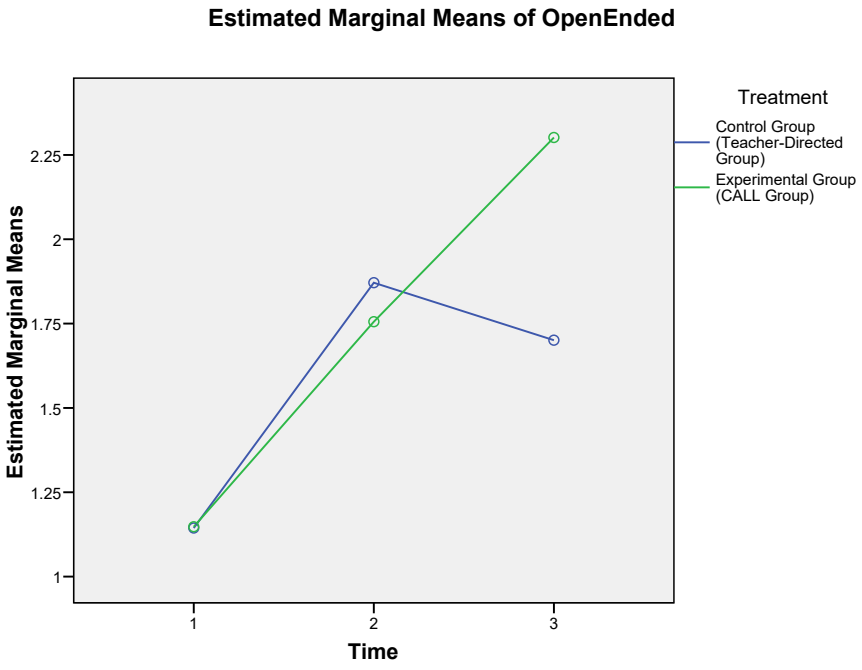


Figure 4.6. Experiment 2 – MANOVA for Time Effect on Open-Ended Test

Summary of the Results for Both Experiments Answering Research Question 1

For *Research Question 1*, in both *Experiment 1* (Pretest & Posttest, n = 107) and *Experiment 2* (Pretest, Posttest, & Delayed Test, n = 40), only *time effect* was statistically significant. For *Experiment 1*, students' scores on the multiple choice, cloze/fill-in-the-blank, and open-ended tests all significantly increased from pretest to posttest. For *Experiment 2*, students' scores on the multiple choice, cloze/fill-in-the-blank, and open-ended tests also significantly increased from pretest to posttest and to delayed test.

Research Question 2 – Experiment 1: Looking at Pretest and Posttest

No students missed more than one class session in both the teacher directed group and the CALL group. All students were included in the data analyses regardless of their attendance to maintain the sample size (n = 107) because among the 122 students who took the pretest, only 107 students took the posttest.

The mixed design repeated measures factorial MANOVA was conducted to assess the impact of the experimental treatment as well as students' level of English proficiency on their pretest and posttest scores.

Interpretation of the Results

Interpretation of the Multivariate Statistics

First of all, Wilks' Lambda test showed that the three-way time by treatment by level interaction (Time * Treatment * Level interaction) was not statistically significant, $\Lambda = .943$, $F(6, 198) = .982$, $p = .439$ (see Table 4.10). In addition, Wilks' Lambda test indicated that the two-way treatment by level interaction (Treatment * Level interaction) was not statistically significant, $\Lambda = .922$, $F(6, 198) = 1.367$, $p = .229$. Another two-way time by level interaction

(Time * Level interaction), however, was statistically significant, $\Lambda = .767$, $F(6, 198) = 4.670$, $p < .001$, which indicated that the relationship between time and the dependent variable (students' performance on the three measures, i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests) depends on their level of English proficiency (see Table 4.10).

Table 4.10.

Experiment 1 – Multivariate Statistics for Time, Treatment, and Level Interaction

Interaction	Wilks' Lambda	*F*	Hypothesis df	Error df	*p*
Time * Treatment * Level	.943	.982	6	198	.439
Treatment * Level	.922	1.367	6	198	.229
Time * Level	.767	4.670	6	198	< .001

Interpretation of the Univariate Statistics

As stated in the interpretation of the multivariate statistics section above, the Wilks' Lambda test indicated the two-way time by level interaction (Time * Level interaction) was statistically significant, $\Lambda = .767$, $F(6, 198) = 4.670$, $p < .001$.

The univariate statistics showed that there was a statistically significant difference among students at different levels from pretest to posttest in the multiple choice test score, F (2, 101) =7.962, p = < .001 (see Table 4.11 and Figure 4.7). Additionally, there was a statistically significant difference among students at different levels from pretest to posttest in the cloze/fill-in-the-blank test score, F (2, 101) = 5.698, p = .005 (see Table 4.11 and Figure 4.8). However, there was no statistically significant difference among students at different levels from pretest to posttest in the open-ended test score, F (2, 101) = 1.175, p = .313 (see Table 4.11).

Table 4.11.

Experiment 1 – Univariate Statistics: *F* Statistics for Time by Level Interaction

Source	Measures	*F*	df	Error df	*p*
Time * Level	Multiple Choice	7.962	2	101	< .001
	Cloze/Fill-in	5.698	2	101	.005
	Open-Ended	1.175	2	101	.313

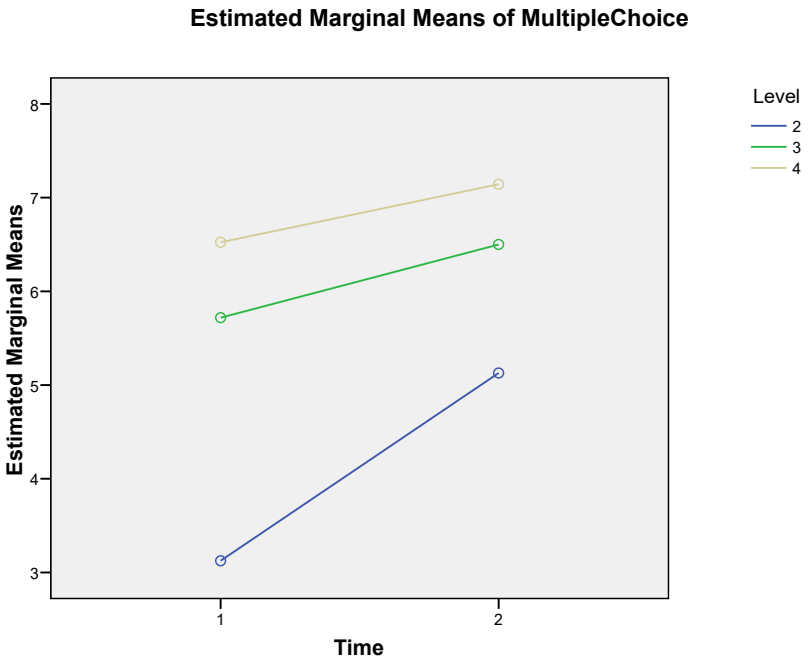


Figure 4.7. Experiment 1 – Time by Level Interaction on Multiple Choice Test

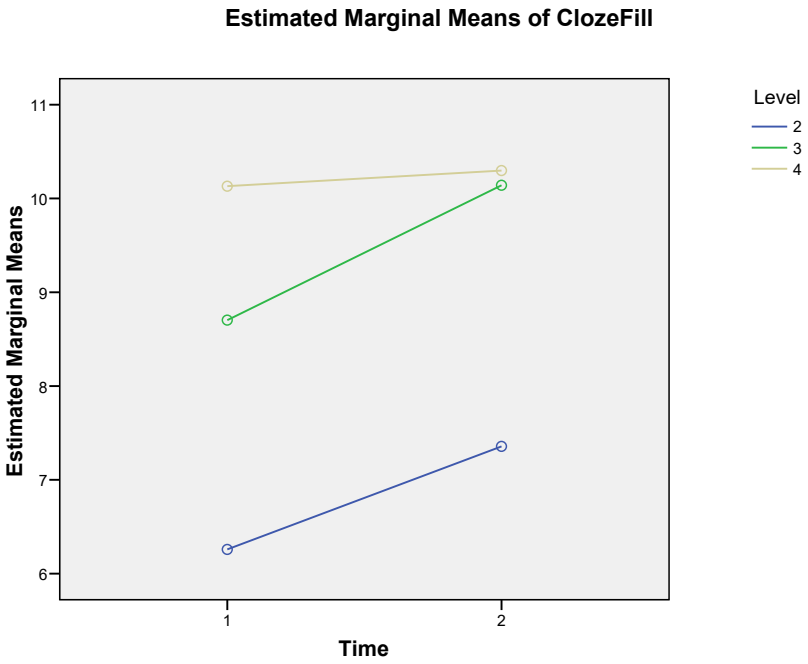


Figure 4.8. Experiment 1 – Time by Level Interaction on Cloze/Fill-in Test

Interpretation of Simple Main Effects Test

The researcher ran a test of simple main effects to further look at the relationship between time and scores on the three measures for each of the three levels of students. The univariate statistics and pairwise comparisons table have indicated the following results:

For level 2 students, there was a statistically significant difference over time in the multiple choice test scores, F (1, 32) = 40.615, $p < .001$ (see Table 4.12). There was an increase from pretest to posttest, $p < .001$, mean difference increased 2.00 (the scale went from 0.00 to 8.00) (see Table 4.13 and Figure 4.9). In addition, there was also a statistically significant difference over time in the cloze/fill-in-the-blank test scores, F (1, 32) = 10.665, $p = .003$ (see Table 4.12). There was an increase from pretest to posttest, $p = .003$, mean difference increased 1.11 (the scale went from 0.00 to 12.00) (see Table 4.13 and Figure 4.10).

For level 3 students, there was a statistically significant difference over time in the multiple choice test scores, F (1, 31) = 6.342, p = .017 (see Table 4.12). There was an increase in score from pretest to posttest, p = .017, mean difference increased 0.78 (the scale went from 0.00 to 8.00) (see Table 4.13 and Figure 4.11). In addition, there was also a statistically significant difference in the cloze/fill-in-the-blank scores between pretest and posttest, F (1, 31) = 17.825, p < .001 (see Table 4.12). There was an increase in score from pretest to posttest, p < .001, mean difference increased 1.44 (the scale went from 0.00 to 12.00) (see Table 4.13 and Figure 4.12).

For level 4 students, there was a statistically significant difference over time in the multiple choice test score, F (1, 41) = 11.804, p = .001 (see Table 4.12). There was an increase in score from pretest to posttest, p = .001, mean difference increased 0.62 (the scale went from 0.00 to 8.00) (see Table 4.13 and Figure 4.13). Nevertheless, there was no statistically significant difference over time in cloze/fill-in-the-blank test score, F (1, 41) = .629, p = .432 (see Table 4.12).

Table 4.12.

Experiment 1 – Univariate Statistics: *F* Statistics by Level

Level	Source	Measures	*F*	df	Error df	*p*
2 Low Intermediate	TimeFactor	Multiple Choice	40.615	1	32	< .001
		Cloze/Fill-in	10.665	1	32	.003
3 High Intermediate	TimeFactor	Multiple Choice	6.342	1	31	.017
		Cloze/Fill-in	17.825	1	31	< .001
4 Advanced	TimeFactor	Multiple Choice	11.804	1	41	.001
		Cloze/Fill-in	.629	1	41	.432

Table 4.13.

Experiment 1 – Pairwise Comparisons for Time by Level Interaction

Level	Measure	TimeFactor	*MD*	*p*
2 Low Intermediate	Multiple Choice	Posttest - Pretest	2.00	< .001
	Cloze/Fill-in	Posttest - Pretest	1.11	.003
3 High Intermediate	Multiple Choice	Posttest - Pretest	0.78	.017
	Cloze/Fill-in	Posttest - Pretest	1.44	< .001
4 Advanced	Multiple Choice	Posttest - Pretest	0.62	.001
	Cloze/Fill-in	Posttest - Pretest	0.17	.432

Note. *MD* = mean difference.

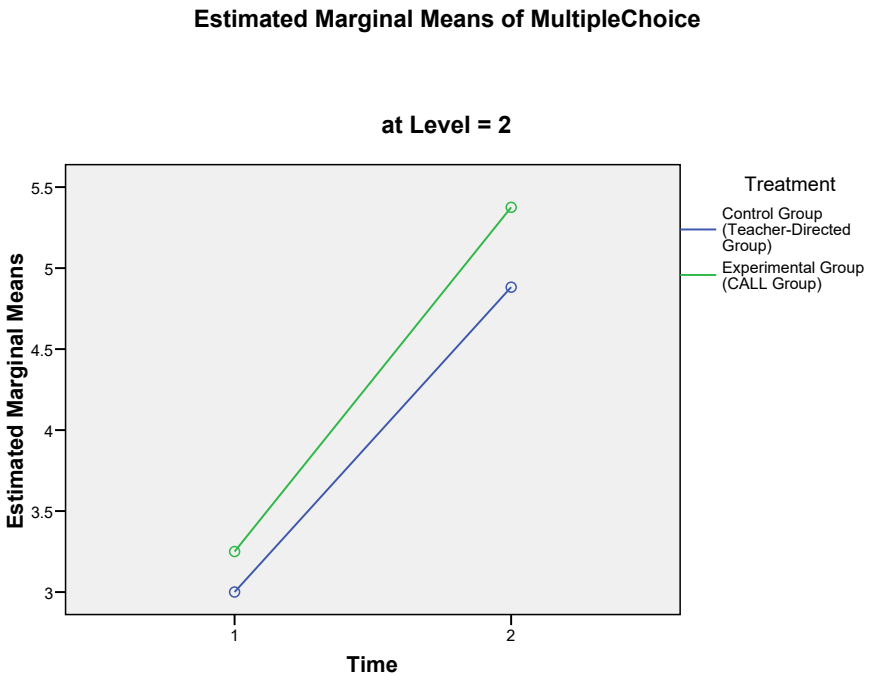


Figure 4.9. MANOVA for Time by Level Interaction on Level 2's Multiple Choice Test

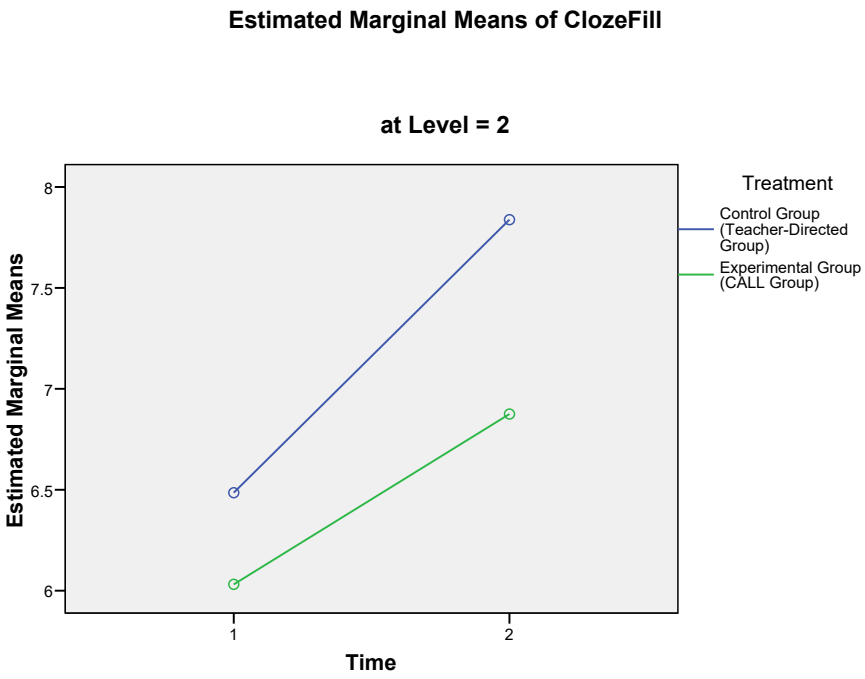


Figure 4.10. MANOVA for Time by Level Interaction on Level 2's Cloze/Fill-in Test

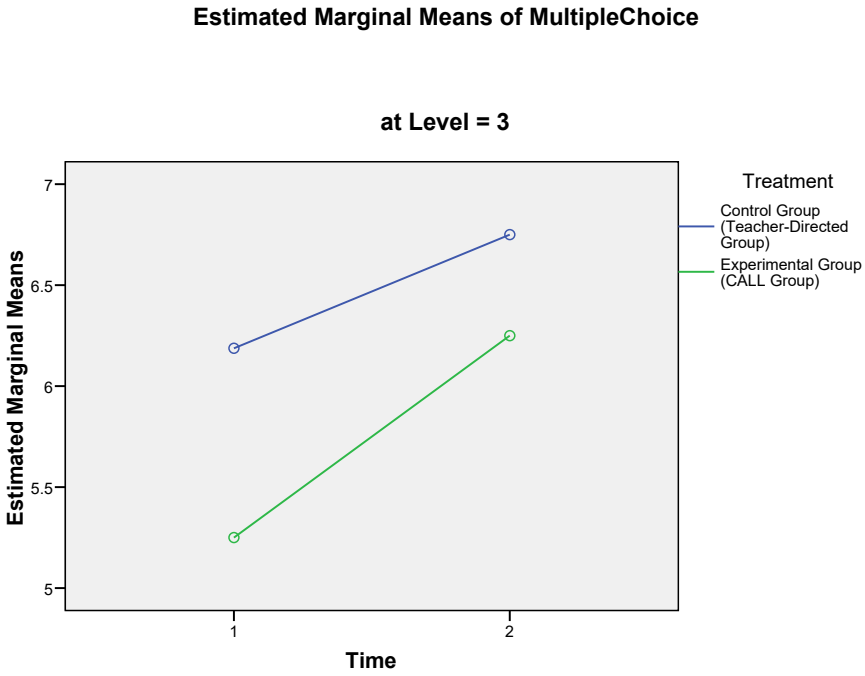


Figure 4.11. MANOVA for Time by Level Interaction on Level 3's Multiple Choice Test

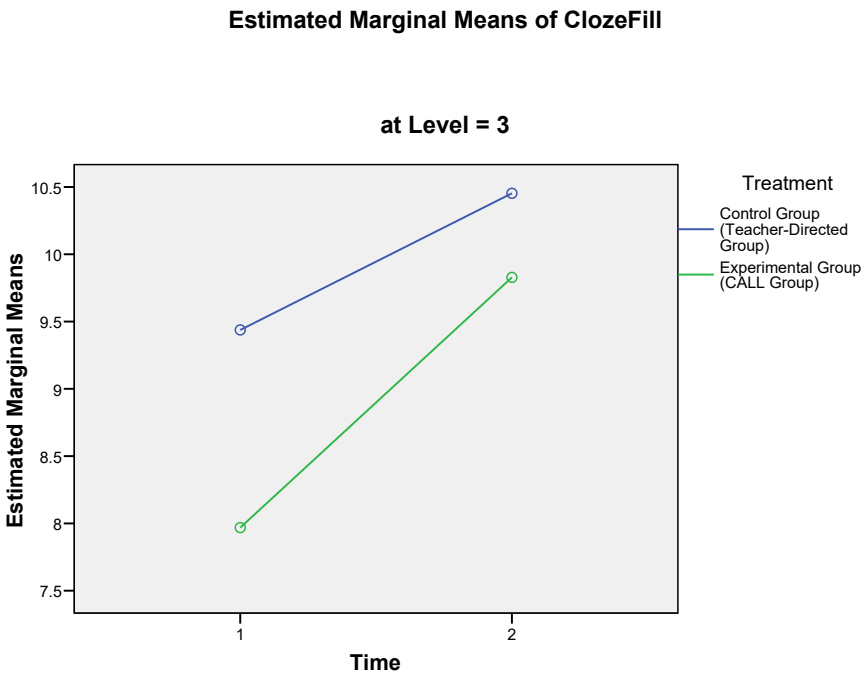


Figure 4.12. MANOVA for Time by Level Interaction on Level 3's Cloze/Fill-in Test

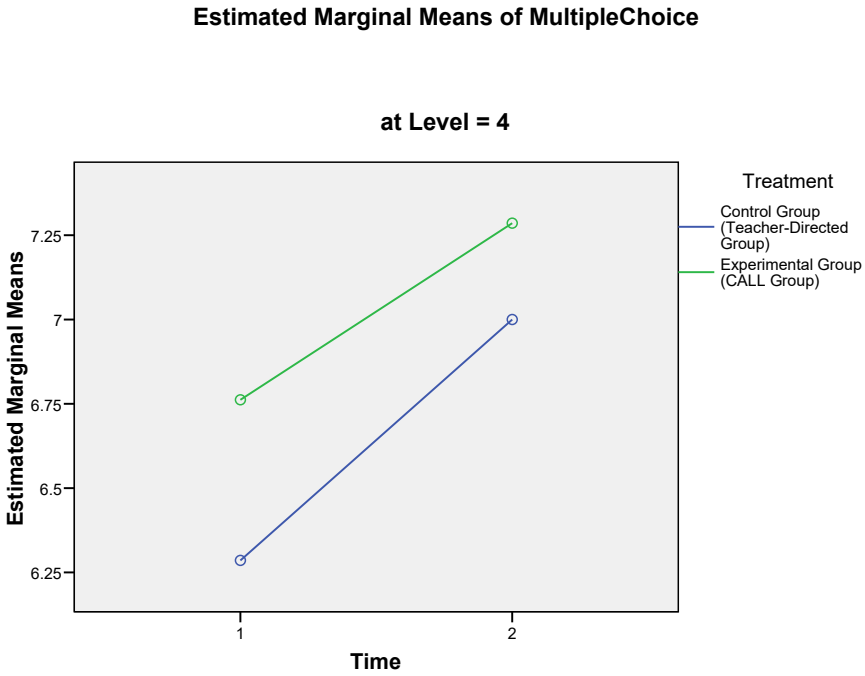


Figure 4.13. MANOVA for Time by Level Interaction on Level 4's Multiple Choice Test

Research Question 2 – Experiment 2: Looking at Pretest, Posttest, and Delayed Test

No students missed more than one class session in both the teacher directed group and the CALL group. All students were included in the data analyses regardless of their attendance because of the small sample size of the delayed test (n = 40).

The mixed design repeated measures factorial MANOVA was conducted to assess the impact of the experimental treatment as well as students' level of English proficiency over time on their scores on the three measures.

Interpretation of the Results

For each of the levels of between-subjects variable, the pattern of inter-correlations among the levels of the within-subjects variable should be the same. This assumption was tested as part of the analysis, using Box's M statistic. Because this statistic is very sensitive, a more conservative alpha level of .001 should be used. The statistic was not significant here, i.e., the probability level (p > .068) was greater than .001; therefore, the assumption of homogeneity of inter-correlations has been met.

Interpretation of the Multivariate Statistics

First of all, Wilks' Lambda test showed that the three-way time by treatment by level interaction (Time * Treatment * Level interaction) was not statistically significant, Λ = .73, F(12, 58) = .824, p = .625 (see Table 4.14). In addition, Wilks' Lambda test indicated that the two-way treatment by level interaction (Treatment * Level interaction) was not statistically significant, Λ = .923, F(6, 64) = .434, p = .853. Another two-way time by level interaction (Time * Level interaction), however, was statistically significant, Λ = .416, F(12, 58) = 2.657, p = .007, which indicated that the relationship between time and the dependent variable

(students' performance on the three measures, i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests) depends on their level of English proficiency.

Table 4.14.

Experiment 2 – Multivariate Statistics for Time, Treatment, and Level Interaction

Interaction	Wilks' Lambda	*F*	Hypothesis df	Error df	*p*
Time * Treatment * Level	.73	.824	12	58	.625
Treatment * Level	.923	.434	6	64	.853
Time * Level	.416	2.657	12	58	.007

The univariate statistics make the assumption of sphericity. The sphericity assumption requires that the variance of the population difference scores for any two conditions are the same as the variance of the population difference scores for any other two conditions. As indicated by the *p* value of .661, .567, .886 in the box labeled Mauchly's Test of Sphericity (see Table 4.15), all of which was not significant (*p* value was greater than .05); therefore, the assumption of sphericity has not been violated.

Table 4.15.

Mauchly's Test of Sphericity

Within Subject Effect	Measure	Mauchly's W	df	*p*
Time	Multiple Choice	.975	2	.661
	Cloze/Fill-in	.966	2	.567
	Open-Ended	.993	2	.886

Interpretation of the Univariate Statistics

As stated earlier in the interpretation of the multivariate statistics section, the Wilks' Lambda test showed that there was a statistically significant two-way time by level interaction (Time * Level interaction), $\Lambda = .416$, $F(12, 58) = 2.657$, $p = .007$, which indicated that the

relationship between time and the dependent variable (students' performance on the three measures) depends on their level of proficiency.

The univariate statistics showed that there was a statistically significant difference in scores over time among students at different levels on the multiple choice tests, F (4, 68) = 3.28, p = .016 (see Table 4.16 and Figure 4.14). However, there was no statistically significant difference in scores over time among students at different levels on the cloze/fill-in-the-blank tests, F (4, 68) = 1.178, p = .328. In addition, there was a statistically significant difference in scores over time among students at different levels on the open-ended tests, F (4, 68) = 2.94, p = .027 (See Table 4.16 and Figure 4.15).

Table 4.16.

Experiment 2 – Univariate Statistics: *F* Statistics for Time by Level Interaction

Source	Measures	*F*	df	Error df	*p*
Time * Level	Multiple Choice	3.28	4	68	.016
	Cloze/Fill-in	1.178	4	68	.328
	Open-Ended	2.94	4	68	.027

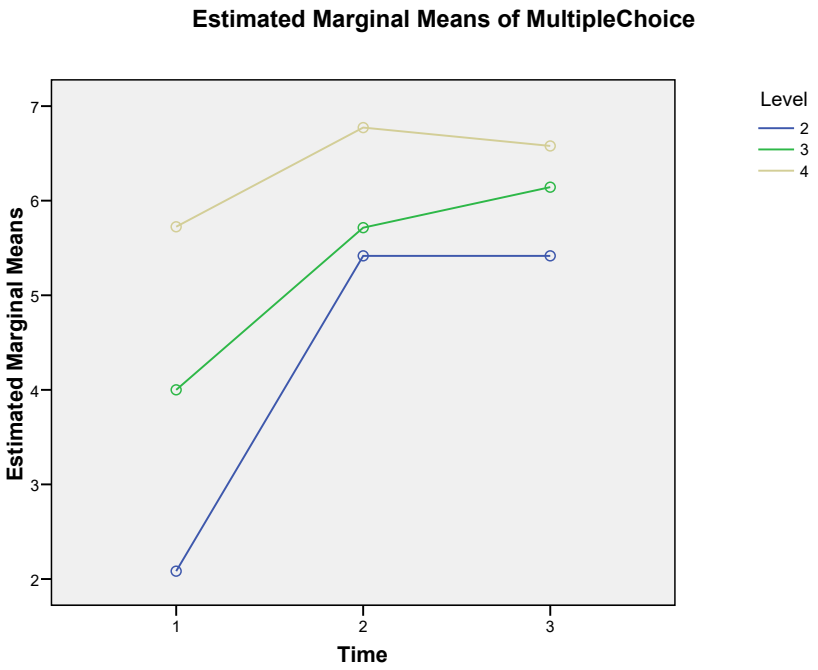


Figure 4.14. Experiment 2 – Time by Level Interaction on Multiple Choice Test

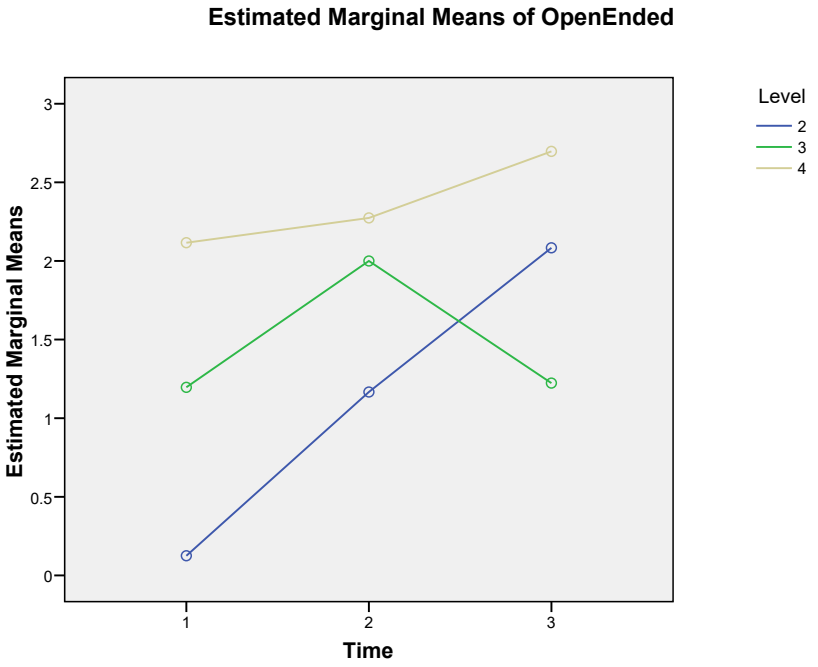


Figure 4.15. Experiment 2 – Time by Level Interaction on Open-Ended Test

Interpretation of Simple Main Effects Test

The researcher ran a test of simple main effects to further look at the relationship between time and the score for each of the three levels of students. The univariate statistics and pairwise comparisons table have indicated the following results:

For level 2 students, there was a statistically significant difference over time in the multiple choice test scores, F (2, 8) = 8.456, p = .011 (see Table 4.17). There was an increase from pretest to posttest, p = .04, mean difference increased 3.00 (the scale went from 0.00 to 8.00) (see Table 4.18 and Figure 4.16), and there was also an increase from pretest to delayed test, p = .003, mean difference increased 3.20 (the scale went from 0.00 to 8.00) (see Table 4.18 and Figure 4.16), but there was no statistically significant difference in score between posttest and delayed test, p = .854 (see Table 4.18). In addition, there was not a statistically significant difference over time in the open-ended test scores, F (2, 8) = 3.254, p = .092 (see Table 4.17).

For level 3 students, there was a statistically significant difference over time in the multiple choice test scores, F (2, 16) = 4.263, p = .033 (see Table 4.17). There was an increase from pretest to delayed test, p = .008, mean difference increased 2.22 (the scale went from 0.00 to 8.00) (see Table 4.18 and Figure 4.17), but there was not a difference in score between pretest and posttest, p = .122 (see Table 4.18). There was not a statistically significant difference between posttest and delayed test, either, p = .419 (see Table 4.18). Additionally, there was no statistically significant difference over time in the open-ended test score, F (2, 16) = 1.541, p = .244 (see Table 4.17).

For level 4 students, there was a statistically significant difference over time in the multiple choice test score, F (2, 50) = 9.363, p < .001 (see Table 4.17). There was an increase

from pretest to posttest, $p = .001$, mean difference increased 1.00 (the scale went from 0.00 to 8.00) (see Table 4.18 and Figure 4.18), and there was also an increase from pretest to delayed test, $p = .004$, mean difference increased 0.85 (the scale went from 0.00 to 8.00) (see Table 4.18 and Figure 4.18). However, there was not a statistically significant difference in score from posttest to delayed test, $p = .490$ (Table 4.18). There was a statistically significant difference over time in the open-ended test score, F (2, 50) = 5.719, $p = .006$ (see Table 4.17). There was an increase from pretest to delayed test, $p = .01$, mean difference increased 0.59 (the scale went from 0.00 to 5.00) (see Table 4.18 and Figure 4.19). There was also an increase from posttest to delayed test, $p = .002$, mean difference increased 0.43 (the scale went from 0.00 to 5.00) (see Table 4.18 and Figure 4.19). However, there was no statistically significant difference in score from pretest to posttest, $p = .436$ (see Table 4.18).

Table 4.17.

Experiment 2 – Univariate Statistics: *F* Statistics for Time by Level Interaction

Level	Source	Measures	*F*	df	Error df	*p*
2 Low Intermediate	TimeFactor	Multiple Choice	8.456	2	8	.011
		Open-Ended	3.254	2	8	.092
3 High Intermediate	TimeFactor	Multiple Choice	4.263	2	16	.033
		Open-Ended	1.541	2	16	.244
4 Advanced	TimeFactor	Multiple Choice	9.363	2	50	< .001
		Open-Ended	5.719	2	50	.006

Table 4.18.

Experiment 2 – Pairwise Comparisons for Time by Level Interaction

Level	Measure	TimeFactor	*MD*	*p*
2 Low Intermediate	Multiple Choice	Posttest - Pretest	3.00	.04
		Delayed - Pretest	3.20	.003
		Delayed - Posttest	0.20	.854
3 High Intermediate	Multiple Choice	Posttest - Pretest	1.56	.122
		Delayed - Pretest	2.22	.008
		Delayed - Posttest	0.67	.419
4 Advanced	Multiple Choice	Posttest - Pretest	1.00	.001
		Delayed - Pretest	0.85	.004
		Posttest - Delayed	0.15	.49
4 Advanced	Open-Ended	Posttest - Pretest	0.15	.436
		Delayed - Pretest	0.59	.01
		Delayed - Posttest	0.43	.002

Note. *MD* = mean difference

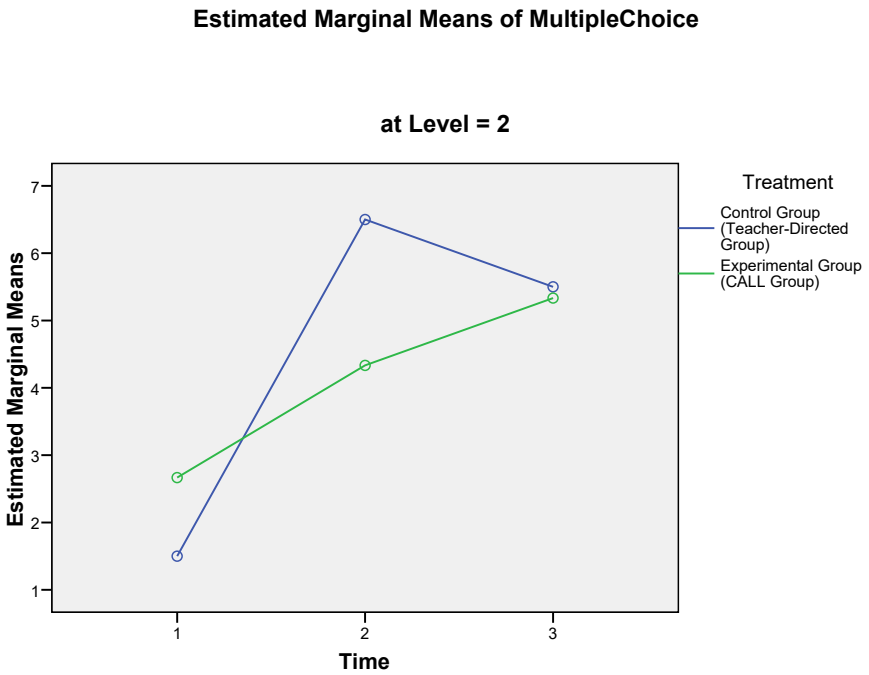


Figure 4.16. MANOVA for Time by Level Interaction on Level 2's Multiple Choice Test

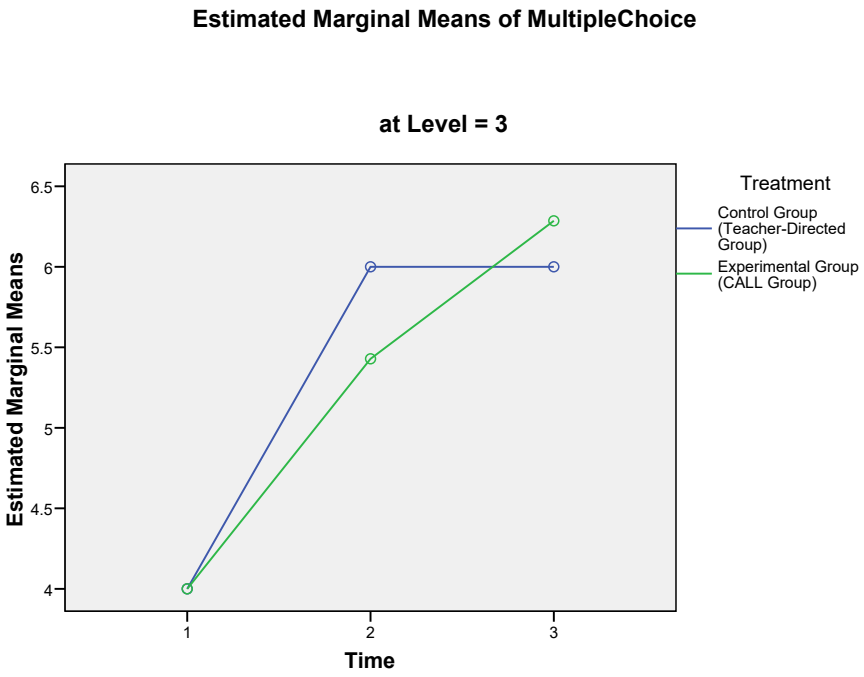


Figure 4.17. MANOVA for Time by Level Interaction on Level 3's Multiple Choice Test

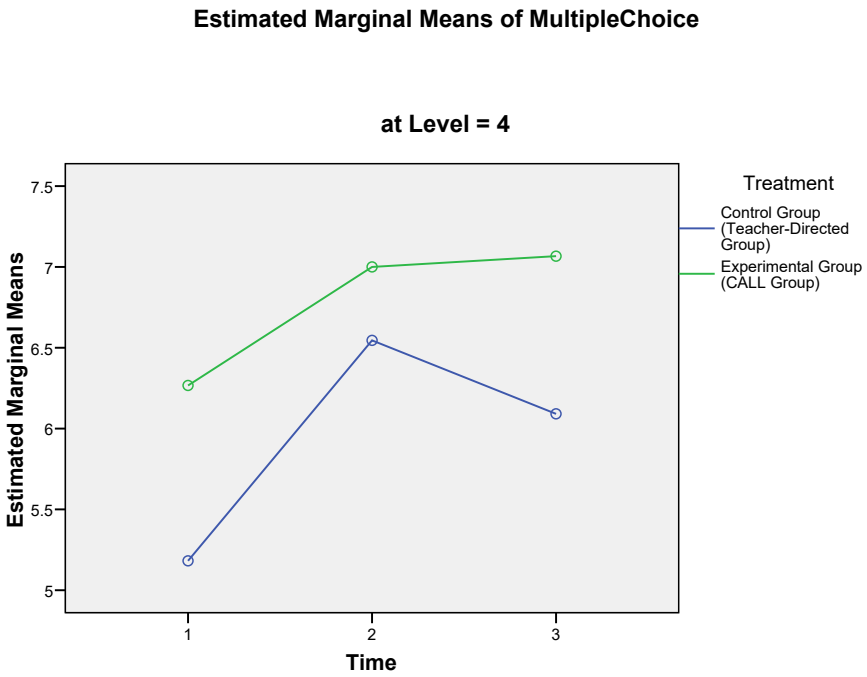


Figure 4.18. MANOVA for Time by Level Interaction on Level 4's Multiple Choice Test

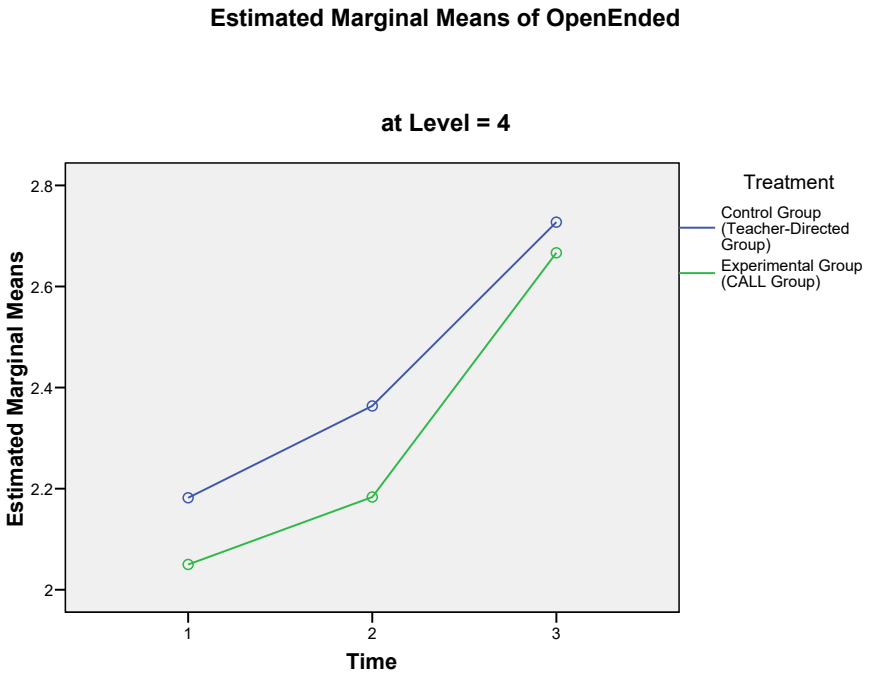


Figure 4.19. MANOVA for Time by Level Interaction on Level 4's Open-Ended Test

Summary Tables

Table 4.19.

Summary Table for Both Experiments Looking at Both Research Questions

	Variables & Interactions	Statistical Significance
Effect	Time	S
	Treatment	NS
	Level	S
Two-Way Interaction	Time * Treatment	NS
	Time * Level	S
	Treatment * Level	NS
Three-Way Interaction	Time * Treatment * Level	NS

Note. S = significant. NS = not significant.

Table 4.20.

Experiment 1 – Descriptive Statistics for Teacher-Directed Group by Level

		Teacher-Directed Group (Control Group)							
		Level 2 Low Intermediate		Level 3 High Intermediate		Level 4 Advanced		Total	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*
Multiple	Pretest	17	3.00(1.50)	16	6.19(1.56)	21	6.29(1.90)	54	5.22(2.25)
Choice	Posttest	17	4.88(1.76)	16	6.75(1.18)	21	7.00(1.41)	54	6.26(1.73)
Cloze/	Pretest	17	6.49(2.18)	16	9.44(2.30)	21	10.37(1.90)	54	8.87(2.67)
Fill-in	Posttest	17	7.84(1.81)	16	10.45(1.24)	21	9.94(2.02)	54	9.43(2.05)
Open-	Pretest	17	0.28(0.57)	16	2.28(2.08)	21	2.89(2.00)	54	1.89(2.03)
Ended	Posttest	17	0.69(0.95)	16	3.09(1.97)	21	3.25(1.85)	54	2.40(2.01)

Table 4.21.

Experiment 1 – Descriptive Statistics for CALL Group by Level

		CALL Group (Experimental Group)							
		Level 2 Low Intermediate		Level 3 High Intermediate		Level 4 Advanced		Total	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*
Multiple	Pretest	16	3.25(1.44)	16	5.25(2.02)	21	6.76(1.67)	53	5.25(2.24)
Choice	Posttest	16	5.38(1.31)	16	6.25(1.57)	21	7.29(1.27)	53	6.40(1.57)
Cloze/	Pretest	16	6.03(1.81)	16	7.97(2.29)	21	9.89(2.14)	53	8.15(2.62)
Fill-in	Posttest	16	6.88(1.46)	16	9.83(2.23)	21	10.65(1.28)	53	9.26(2.31)
Open-	Pretest	16	0.34(0.58)	16	1.45(1.87)	21	2.21(1.85)	53	1.42(1.74)
Ended	Posttest	16	1.08(1.03)	16	2.64(2.00)	21	2.93(1.92)	53	2.28(1.88)

Table 4.22.

Experiment 2 – Descriptive Statistics for Teacher-Directed Group by Level

		Teacher-Directed Group (Control Group)							
		Level 2 Low Intermediate		Level 3 High Intermediate		Level 4 Advanced		Total	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*
Multiple Choice	Pretest	2	1.50(0.71)	2	4.00(1.41)	11	5.18(1.99)	15	4.53(2.17)
	Posttest	2	6.50(2.12)	2	6.00(1.41)	11	6.55(1.70)	15	6.47(1.60)
	Delayed	2	5.50(0.71)	2	6.00(2.83)	11	6.09(2.34)	15	6.00(2.14)
Cloze/ Fill-in	Pretest	2	7.00(0.00)	2	8.63(2.30)	11	9.70(2.33)	15	9.20(2.28)
	Posttest	2	7.50(2.12)	2	9.88(1.24)	11	9.20(2.39)	15	9.07(2.23)
	Delayed	2	7.25(3.18)	2	8.63(0.88)	11	9.64(2.29)	15	9.18(2.30)
Open-Ended	Pretest	2	0.00(0.00)	2	1.25(0.35)	11	2.18(2.02)	15	1.77(1.88)
	Posttest	2	1.25(0.35)	2	2.00(0.35)	11	2.36(2.00)	15	2.17(1.74)
	Delayed	2	1.75(2.47)	2	0.63(0.88)	11	2.73(2.07)	15	2.32(2.04)

Table 4.23.

Experiment 2 – Descriptive Statistics for CALL Group by Level

		CALL Group (Experimental Group)							
		Level 2 Low Intermediate		Level 3 High Intermediate		Level 4 Advanced		Total	
Measure	Time	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*	*n*	*M(SD)*
Multiple Choice	Pretest	3	2.67(0.58)	7	4.00(2.38)	15	6.27(1.75)	25	5.20(2.27)
	Posttest	3	4.33(1.53)	7	5.43(1.99)	15	7.00(1.41)	25	6.24(1.83)
	Delayed	3	5.33(0.58)	7	6.29(0.49)	15	7.07(1.16)	25	6.64(1.11)
Cloze/ Fill-in	Pretest	3	5.83(2.02)	7	6.89(2.73)	15	9.52(2.34)	25	8.34(2.77)
	Posttest	3	6.50(1.39)	7	8.71(2.97)	15	10.38(1.43)	25	9.45(2.31)
	Delayed	3	6.17(1.04)	7	10.39(0.75)	15	10.47(1.63)	25	9.93(1.95)
Open-Ended	Pretest	3	0.25(0.43)	7	1.14(1.54)	15	2.05(1.58)	25	1.58(1.58)
	Posttest	3	1.08(0.95)	7	2.00(0.35)	15	2.36(2.00)	25	2.00(1.72)
	Delayed	3	2.42(2.10)	7	1.82(1.48)	15	2.67(1.88)	25	2.40(1.77)

Table 4.24.

Summary Table for Research Question 1 - Both Experiments

	Variables & Interactions	Statistical Significance
Two-Way Interaction	Time * Treatment	NS
Effect	Treatment	NS
	Time	S
Time Effect on the Measures	Multiple Choice	S
	Cloze/Fill-in	S
	Open-Ended	S

Note. S = significant. NS = not significant.

Table 4.25.

Summary Table for Research Question 2 – Experiment 1

	Variables & Interactions	Statistical Significance
Three-Way Interaction	Time * Treatment * Level	NS
Two-Way Interaction	Time * Treatment	NS
	Treatment * Level	NS
	Time * Level	S
Time by Level Interaction on the Measures	Multiple Choice	S
	Cloze/Fill-in	S
Level 2 Low Intermediate	Multiple Choice	S
	Cloze/Fill-in	S
Level 3 High Intermediate	Multiple Choice	S
	Cloze/Fill-in	S
Level 4 Advanced	Multiple Choice	S
	Cloze/Fill-in	NS
Level 2 Low Intermediate	Multiple Choice Pretest to Posttest	S Increase in Scores
	Cloze/Fill-in Pretest to Posttest	S Increase in Scores
Level 3 High Intermediate	Multiple Choice Pretest to Posttest	S Increase in Scores
	Cloze/Fill-in Pretest to Posttest	S Increase in Scores
Level 4 Advanced	Multiple Choice Pretest to Posttest	S Increase in Scores

Note. S = significant. NS = not significant.

Table 4.26.

Summary Table for Research Question 2 – Experiment 2

	Variables & Interactions	Statistical Significance
Three-Way Interaction	Time * Treatment * Level	NS
Two-Way Interaction	Time * Treatment	NS
	Treatment * Level	NS
	Time * Level	S
Time by Level Interaction on the Measures	Multiple Choice	S
	Open-Ended	S
Level 2 Low Intermediate	Multiple Choice	S
	Open-Ended	NS
Level 3 High Intermediate	Multiple Choice	S
	Open-Ended	NS
Level 4 Advanced	Multiple Choice	S
	Open-Ended	S
Level 2 Low Intermediate	Multiple Choice Pretest to Posttest	S Increase in Scores
	Multiple Choice Posttest to Delayed	S Increase in Scores
Level 3 High Intermediate	Multiple Choice Pretest to Delayed	S Increase in Scores
Level 4 Advanced	Multiple Choice Pretest to Posttest	S Increase in Scores
	Multiple Choice Pretest to Delayed	S Increase in Scores
	Open-Ended Pretest to Delayed	S Increase in Scores
	Open-Ended Posttest to Delayed	S Increase in Scores

Note. S = significant. NS = not significant.

Qualitative Study Component – Interview Script

The researcher interviewed 3 students from each level in the experimental group at the end of the experimental study when they completed their delayed tests, i.e., a student whose grades were in the bottom 1/3, another in the middle 1/3, and one in the top 1/3 of each level; therefore, a total of 9 students were interviewed.

The interview questions were as follows: 1) What do you think about the *Azar Interactive* online grammar instruction program? 2) Do you think it's helpful for learning the passive grammatical forms?

Of the 9 students interviewed, the summaries below were reflective of their responses, and comments included were those similar between the students. The summaries present students' responses in bullet points. In addition to the summaries, under the positive and neutral/negative reflection sections, there are direct "quotes" from the interviewees.

Summary of Interviews from Advanced Learners

- The advanced learners (Level 4 students) interviewed liked the *Azar Interactive* online program because they thought it is didactic, interactive, practical, organized, and convenient to learn.
- They loved the "talking head" feature of the program, which provides clear explanation of the grammatical structures, the listening activities as well as the various types of practice exercises, which follow certain progression, can enhance and reinforce structures acquired, and make them more motivated to learn grammar.

- One of the advanced learners interviewed thought students still need teachers to explain the grammatical concepts because the computer program was better for practicing, but it was not good for learning new structures.
- The learner preferred learning grammar from a teacher with better interaction in the classroom because they said sometimes they need more clarification and explanation than just clicking on "check answers" button to get the correct answers.

Positive Reflection

"I like the online program because it was didactic." "I think the computer program is awesome because it is interactive." "The assignments were really good for us. I could understand everything." "I think the online exercises are very nice because I have the Azar textbook. Sometimes because the numbers of the exercises in the textbook are too many, so I would skip the chapter introduction and charts introducing the grammar points and go straight to do the practice exercises." "I think the listening activity is very useful, and it's very oral; however, it was challenging and difficult to recognize the pronunciation of the modal "could've", so I couldn't tell when I tried it for the first time. I got more excited as I went through the program." "I think the computer program is very practical, and there are a variety of questions, so I was able to figure out my weaknesses in learning the passive grammatical forms. However, I do not like the fact that when I typed in "abbreviations" of some forms, they were counted as wrong answers. To sum up, I liked the software as a whole. I think it's quite easy to understand the grammar points explained in the computer software as compared with reading a grammar book by myself because it was more difficult to understand the concepts when no one explains the grammar rules to me, and it could get boring easily." "The exercises in the textbook are mostly

written exercises, but this computer software not only has charts, "talking head" explanation of the grammar points, and there are various types of practice exercises. I also liked the fact that this computer software has combined listening and speaking activity, which seems very interesting to me!" "I think Azar is a very convenient software to use, and it's easy to use. There is a certain progression of questions/practice exercises, which build on the previous grammar point learned, which I think it very good. I especially like the listening part and the "talking head" because the native speakers' pronunciation and intonation is very cute, interesting, and fun, which makes me more motivated to learn grammar. Also, the Azar software has helped me review some of the grammar points I have learned before but have forgotten. It's very good for review as well." "This is the first time I have ever utilized an online software to learn grammar. I think it's very fresh to me. The way the program is set up to explain the grammar point is very organized and clear, and it wouldn't make people feel bored. I really like this computer program!" "I love this online courseware! I think it is very practical. Especially immediately after the explanation of each chapters/grammar points, there are practice exercises await us to complete and to enhance/reinforce what we learned." "I think the "talking head" design where it has characters to explain the grammar points, which is just like watching a real teacher teaching grammar to me so that I would not get bored easily."

Neutral/Negative Reflection

"The *Azar Interactive* software was good, but I think we still need teachers to explain grammar points." "I think the computer program is better for practicing not for learning new grammar rules. Computer is an interesting tool to learn grammar, but I do not think it's very helpful. The examples are similar in each section, so it starts to get boring." "I prefer a teacher in

the classroom because there is better interaction in the classroom. I prefer learning grammar with a teacher instead of using a computer program because sometimes I need more clarification and explanation than just clicking on "check answers" button to get the correct answers."

Summary of Interviews from High Intermediate Learners

- The high intermediate learners (Level 3 students) interviewed thought it was easy and convenient to learn grammar from the *Azar Interactive* online program.
- They liked the layout of the program, the "talking head" feature, and the wide variety of practice exercises and thought it was really interactive and as good as learning from a real teacher. Although they considered the listening activities to be challenging, they thought they were helpful for improving their listening skills.
- They said the practice activities helped them review grammar points learned, and it was great that they could click on the "check answers" button to see they got the right answers to the questions immediately.
- Overall, they thought the program was interesting and well-designed, and they were motivated to use the program.
- One interviewee from this level even recommended the IEP to purchase the *Azar Interactive* program for future classes.
- Some of the high intermediate learners interviewed thought the program was not enough for learning grammar. They did not like to study by themselves and expressed that not having someone by their sides to ask questions when in doubt was very frustrating.

Positive Reflection

"The online program was awesome, perfect, and incredible." "I like the *Azar Interactive* program's layout. I think everyone could use the software to learn grammar." "I think the program was good for me. It was a well-made program, and it was easy and convenient to learn grammar from the program." "I really like the program. It was really interactive and as good as learning from a real teacher." "The computer program helped me review what I have learned about the passive voice, I was able to complete many practice exercises. It was really helpful in terms of helping me review what I forgot or what I am not familiar with regarding the passive. I did a lot of useful exercises, which was very good." "I think the *Azar Interactive* software is very interesting and easy to learn. I would have motivation to continue to work on the practice exercises by myself. Nevertheless, I think some of the dialogues and listening comprehension activities are very challenging, which could strengthen my weaknesses in the passive voice." "I think the *Azar Interactive* contains very good fundamental practices for grammar. It also includes vocabulary and listening training. The "talking head" animation did help reinforce the structures learned. I think it's a wonderful learning tool." "I like the *Azar Interactive* software and think it's perfect for learning grammar. I hope our school could purchase it for our future classes." "I think the Azar software is perfect because learning grammar is like learning math. The more practices we did, the more grammar rules we could learn well. I liked that a wide variety of practice exercises also helped us understand and enhance a lot of grammar points learned." "There are a lot of pictures and listening activities, which I think is a good way to help me learn grammar." "I found the *Azar Interactive* program useful for learning grammar. I especially liked the listening part. Although we understand the grammar well with our eyes, but distinguishing the suffixes, -

ed, -ing is very difficult for foreigners. I think these practices of Azar has helped me improve my listening skills. Furthermore, I also hope the mixed grammar parts are more to review all that we learned. Thank you for a good program!" "Some exercises were easy, such as drag-and-drop exercises, but some exercises, like the listening ones were much more difficult because the speaker sometimes speaks too fast for us to recognize the words." "My favorite part is that I can see the correct answers just right after I hit the "check answers" button. I think it's very helpful!" "I think the materials in the *Azar Interactive* program are excellent. They are not too difficult to complete at my current level of English proficiency. Therefore, I think if I could do a part each day, I would make great progress in learning grammar."

Neutral/Negative Reflection

"I think the computer was helpful because of the exercises. However, I think grammar should be taught by a teacher because learning grammar is like learning math, we need a teacher to teach us, and I think the computer program is not enough." "The computer program was a new thing to me, so it was something hard because I had to do it and study by myself." "If we have a teacher before or after the computer program that she/he can answer our questions, I think I will learn it better because my friends and I had a lot of questions, but no one knows the answers." "The computer software was interesting to me; however, it was sometimes frustrating to learn by myself when I did not have anyone to answer my questions right away." "I like to learn grammar using the computer software, but I also like to refresh information learned, so I prefer studying with a teacher instead of using computer. The most important thing is when I leave the classroom, I can take more information home, or just review what we learned in class by the computer." "I think the computer software is very helpful, but there are several things I would

like to talk about. First of all, I hope there is a real teacher that can give us an idea about the lesson. Secondly, there are a lot of exercises which affect reading and writing. It took me a lot of time to do the reading and writing exercises, so I did not have enough time to study the materials. Finally, thank you for giving me this opportunity to use this computer program!"

Summary of Interviews from Low Intermediate Learners

- The low intermediate learners (Level 2 students) interviewed said the *Azar* program was a very useful, interesting and fun way to learn grammar as compared with the grammar book, which was boring and long.
- They liked the exercises in general. They also liked the fact that they could do the same exercises again when making mistakes to correct them. They thought the explanation of the grammar points was clear, and it was great that the exercises followed the explanation and had various different ways to type in the answers.
- Some of the low intermediate learners interviewed said they preferred learning from a classroom teacher because they did not like to study by themselves. In addition, they would like to have a teacher to answer their questions and explained the grammar rules to them right away instead of having to figure out by themselves using the *Azar Interactive* online program.
- One interviewee pointed out that there was no internet access at home, so he had to stay at school after class to complete the practice activities assigned each day during the course of the study.

Positive Reflection

"The computer program is very interesting and has a lot of information that helps students to learn grammar. I think using the computer software to learn grammar is good experience for me, but I need more time to study grammar by this software." "In general, I like it. Azar grammar is very useful. There are a lot of exercises in the program, and I think the colorful pictures are interesting and fun." "I think this online courseware is very interesting. Not like many other grammar books that are boring and long, this software taught me a lot of things, and the grammar games were very interesting." "I think it's very interesting to learn grammar online. I liked that we could do the same exercises again when we made mistakes to correct them." "I think the Azar software is very good, and the explanation of the grammar points and charts are also very clear. There are exercises following the explanation of the grammar points, which is excellent!" "I think the Azar online program is very interesting. There are many exercises that require different ways to type in the answers, just like we are playing games, which made the boring grammar easier to learn and to understand. I really like it!" "I think the *Azar* program is quite interesting, and using it to learn grammar is a lot of fun!" "I think the software is helpful, and it's very interesting. I got more familiar with the grammar points which I used to be confused about, and I think it is a very interesting and fun way to learn grammar!"

Neutral/Negative Reflection

"I think teacher is better for me because I do not like to study grammar by computer on my own. I prefer a classroom with a teacher." "I think using the computer program is a new and good way to learn grammar. The advantage is we have a lot of exercises to do, and the more practices, the better. The disadvantage is there is no explanation for when we should use the

passive. We do not know when I will use the passive in our life." "If I can say something about the computer program, I think it is good, but we can do all the exercises at home, and we do not need a teacher, actually, we need a teacher." (This statement appears contradictory; therefore, the researcher revised the statement and put it in brackets because after the revisions, it is not direct quote anymore.). [If I can say something about the computer program, I think it is good, but we can do all the exercises at home, and we do not need a teacher. However, when I used the computer software to learn grammar at home, I got confused, and no one was there to help me. So, I think it is better to have someone who can help you, correct you, and answer your questions, like a teacher in the classroom is able to.] "I think the Azar program is good. The questions are not so difficult that you do not want to answer, but some may make you to think a while. Although I think questions are a little too many for me, but I think it is doable." "I think the software is good, and I like the experiment of using the software to learn grammar; however, I think we need more time to finish all the exercises." "There are many advantages to learn grammar by computer, but there are also disadvantages for that. We need to have internet to be able to finish all the exercises, and I do not have internet at home, so I have to stay at school after class to do the exercises."

Conclusions of the Chapter

This study investigated whether there were any statistically significant differences in acquisition of passive grammatical forms on the three measures, i.e., multiple-choice, cloze/fill-in-the-blank, and open-ended tests for post-secondary ESL students who were taught only by traditional classroom teacher-directed instruction versus those who were taught solely by Computer-Assisted Language Learning (CALL).

Main Findings of the Quantitative Component of the Study

For *Research Question 1*, in both *Experiment* 1 (Pretest & Posttest, $n = 107$) and *Experiment 2* (Pretest, Posttest, & Delayed Test, $n = 40$), only *time effect* was statistically significant. All level of classes scored significantly higher on their posttests than their pretests on all three measures. However, there was no statistically significant difference in the test scores between treatments, i.e., teacher-directed group and CALL group.

For *Research Question 2*, in both experiments, only *time by level interaction* was statistically significant. In other words, there was a statistically significant difference in the test scores of all three measures over time by students' level of English proficiency. Level 4, the advanced classes did significantly better than Level 3, the high intermediate classes, and Level 3 did significantly better than Level 2, the low intermediate classes.

Specifically, for *Research Question 2 – Experiment 1*, there was statistically significant difference in scores on the multiple choice and cloze/fill-in-the-blank tests. The multiple choice and cloze/fill-in-the-blank test scores had statistically significant increase from pretest to posttest for Levels 2 and 3 students. For Level 4 students, there was a statistically significant increase in scores on the multiple choice test from pretest to posttest. However, there was no statistically significant increase in scores on the cloze/fill-in-the-blank test for Level 4 students.

Furthermore, for *Research Question 2 – Experiment 2*, there was a statistically significant increase in scores on the multiple choice and open-ended tests. In addition, For Level 2 students, there was a statistically significant increase in scores on the multiple choice test from pretest to posttest as well as from posttest to delayed test. There was not a statistically significant difference in scores on the open-ended test for Level 2 students. For Level 3 students, there was

a statistically significant increase in scores on the multiple choice test from pretest to delayed test. There was no statistically significant difference in scores on the open-ended test for Level 3 students, either. For Level 4 students, there were statistically significant difference in scores on the multiple choice and open-ended tests. Their multiple choice test scores had increased from pretest to posttest as well as from pretest to delayed test. Their open-ended test scores had increased from pretest to delayed test as well as from posttest to delayed test.

Summary of the Qualitative Component of the Study

The advanced learners (Level 4 students) interviewed liked the *Azar Interactive* online program because they thought it is didactic, interactive, practical, organized, and convenient to learn. They loved the "talking head" feature of the program, which provides clear explanation of the grammatical structures, the listening activities as well as the various types of practice exercises, which follow certain progression, can enhance and reinforce structures acquired, and make them more motivated to learn grammar. One of the advanced learners interviewed thought students still need teachers to explain the grammatical concepts because the computer program was better for practicing, but it was not good for learning new structures. The learner preferred learning grammar from a teacher with better interaction in the classroom because they said sometimes they need more clarification and explanation than just clicking on "check answers" button to get the correct answers.

The high intermediate learners (Level 3 students) interviewed thought it was easy and convenient to learn grammar from the *Azar Interactive* online program. They liked the layout of the program, the "talking head" feature, and the wide variety of practice exercises and thought it was really interactive and as good as learning from a real teacher. Although they considered the

listening activities to be challenging, they thought they were helpful for improving their listening skills. They said the practice activities helped them review grammar points learned, and it was great that they could click on the "check answers" button to see they got the right answers to the questions immediately. Overall, they thought the program was interesting and well-designed, and they were motivated to use the program. One interviewee from this level even recommended the IEP to purchase the *Azar Interactive* program for future classes. Some of the high intermediate learners interviewed thought the program was not enough for learning grammar. They did not like to study by themselves and expressed that not having someone by their sides to ask questions when in doubt was very frustrating.

The low intermediate learners (Level 2 students) interviewed said the *Azar* program was a very useful, interesting and fun way to learn grammar as compared with the grammar book, which was boring and long. They liked the exercises in general. They also liked the fact that they could do the same exercises again when making mistakes to correct them. They thought the explanation of the grammar points was clear, and it was great that the exercises followed the explanation and had various different ways to type in the answers. Some of the low intermediate learners interviewed said they preferred learning from a classroom teacher because they did not like to study by themselves. In addition, they would like to have a teacher to answer their questions and explained the grammar rules to them right away instead of having to figure out by themselves using the *Azar Interactive* online program. One interviewee pointed out that there was no internet access at home, so he had to stay at school after class to complete the practice activities assigned each day during the course of the study.

CHAPTER FIVE: DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

A summary of the findings, discussion of the conclusions, research implications, and recommendations for future research are included in this chapter.

Summary of the Findings

Since this study comprised two experiments, i.e., *Experiment 1* with a larger sample size (n = 107), and *Experiment 2* with a smaller sample size (n = 40), the results for each experiment were reported separately. In addition, both research questions addressed in this study applied to both experiments and were discussed for each experiment. Trends across the two experiments were also discussed. It must be noted that although data in the two experiments were analyzed separately because the test scores in *Experiment 2* were also used in *Experiment 1*, the two experiments were not independent of each other

Research Questions

The research questions of this study were:

1. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher-directed classroom setting as compared with ESL students taught by CALL (Computer-Assisted Language Learning)?
2. Is there a statistically significant difference in acquisition of the passive grammatical forms for ESL students taught in a traditional teacher-directed classroom setting as compared with ESL students taught by CALL (Computer-Assisted Language Learning) based on their current English proficiency level (low intermediate, high intermediate, and advanced)?

Research Question 1 – Experiment 1: Looking at Pretest and Posttest

For *Research Question 1*, in *Experiment 1* (Pretest & Posttest, $n = 107$), only *time effect* was statistically significant. All level of classes scored significantly higher on the posttest than on the pretest on all three measures. However, there was no statistically significant difference in the test scores between treatments, i.e., teacher-directed group and CALL group, which indicated that the CALL group performed as well as the teacher-directed group, and the CALL instruction was as effective as the traditional classroom teacher-directed instruction for teaching grammar.

First of all, there was a statistically significant difference in score in the multiple choice test (The scale went from 0.00 to 8.00. The teacher group's mean went from 5.22 to 6.26 (+1.04), and the CALL group's mean increased from 5.25 to 6.40 (+1.15)).

Secondly, there was a statistically significant difference in score in the cloze/fill-in-the-blank test (The scale went from 0.00 to 12.00. The teacher group's mean went from 8.87 to 9.43 (+0.56), and the CALL group's mean increased from 8.14 to 9.26 (+1.12)).

Finally, there was a statistically significant difference in score in the open-ended test (The scale went from 0.00 to 5.00. The teacher group's mean went from 1.89 to 2.40 (+0.51), and the CALL group's mean increased from 1.42 to 2.28 (+0.86)) from pretest to posttest.

Research Question 1 – Experiment 2: Looking at Pretest, Posttest, and Delayed Test

For *Research Question 1*, in *Experiment 2* (Pretest, Posttest, & Delayed Test, $n = 40$), only *time effect* was statistically significant. There was statistically significant difference in test scores between pretest, posttest, and delayed test. However, there was no statistically significant difference in the test scores between treatments, i.e., teacher-directed group and CALL group. Again, these results indicated that the CALL group performed as well as the teacher-directed

group, and the CALL instruction was as effective as the traditional classroom teacher-directed instruction for teaching grammar.

First of all, there was a statistically significant difference in score in the multiple choice test (The scale went from 0.00 to 8.00). The teacher group's mean for pretest to posttest went from 4.53 to 6.47 (+1.94), which increased more as compared with CALL group's mean increase (+1.13), and the teacher group's mean for posttest to delayed test went from 6.47 to 6.00 (-0.47), demonstrating that students in the teacher-directed group were slightly inferior to the CALL grammar instruction group in retaining their knowledge of passive grammatical forms learned, which might be because the CALL group could utilize the *Azar Interactive* software to learn the passive grammatical forms at their own pace and complete plenty of exercises to retain the knowledge learned. The CALL group's mean for pretest to posttest went from 5.25 to 6.38 (+1.13), and posttest to delayed test went from 6.38 to 6.63 (+0.25).

In addition, there was a statistically significant difference in score in the cloze/fill-in-the-blank test (The scale went from 0.00 to 12.00. The teacher group's mean went from 9.20 to 9.06 and to 9.18, which was about the same range. The CALL group's mean went from 8.36 to 9.34 (+0.98) and to 9.92 (+0.58)), which showed increase from pretest to posttest to delayed test.

Finally, there was a statistically significant difference in score in the open-ended test (The scale went from 0.00 to 5.00. The teacher group's mean went from 1.77 to 2.17 and to 2.32, and the CALL group's mean went from 1.61 to 2.08 and to 2.46) from pretest to posttest and to delayed test. Both groups' mean increased across the three time periods.

Research Question 2 – Experiment 1: Looking at Pretest and Posttest

For *Research Question 2*, in *Experiment 1*, only *time by level interaction* was statistically significant. In other words, there was a statistically significant difference in the test scores of all three measures over time by students' level of English proficiency. Level 4, the advanced classes did significantly better than Level 3, the high intermediate classes, and Level 3 did significantly better than Level 2, the low intermediate classes.

Specifically, for *Research Question 2*, in *Experiment 1*, there was statistically significant difference in scores on the multiple choice and cloze/fill-in-the-blank tests only. In addition, For Level 2 and Level 3 students, the multiple choice and cloze/fill-in-the-blank test scores significantly increase from pretest to posttest. For Level 4 students, only the multiple choice test score significantly increase from pretest to posttest. The cloze/fill-in-the-blank test score was not statistically significant.

For all Levels 2, 3, and 4 students, there was no statistically significant difference in scores on the open-ended test, which may imply that the *Azar* grammar book as well as the *Azar Interactive* online program are good at preparing students with multiple choice and fill-in-the-blank tests, but not very effective for improving students' performance on the open-ended tests because of the limitations of the practice exercises and activities designed in the program. This was supported by Hanson-Smith's (1999) study, which indicated that some of the advantages of the *Azar Interactive* online program are that students *receive corrective responses immediately*, and for students planning to take the paper-based TOEFL (PBT), this type of exercise most resembles the test. Nevertheless, students may eventually do well at filling in the blanks while still having lots of trouble using the target structures in their own writing (Hanson-Smith, 1999).

Research Question 2 – Experiment 2: Looking at Pretest, Posttest, and Delayed Test

For *Research Question 2*, in *Experiment 2*, only *time by level interaction* was statistically significant. In other words, there was a statistically significant difference in test scores for all three measures over time by students' level of English proficiency. Level 4, the advanced classes did significantly better than Level 3, the high intermediate classes, and Level 3 did significantly better than Level 2, the low intermediate classes.

Furthermore, for *Research Question* 2, in Experiment *2*, there was statistically significant difference in scores on the multiple choice and open-ended tests only. For Level 2 students, there was statistically significant difference in score on the multiple choice test from pretest to posttest as well as from posttest to delayed test. There was no statistically significant difference in score on the open-ended test for Level 2 student. The sample size was too small (n = 5) to draw any conclusion from the results.

For Level 3 students, there was statistically significant difference in score on the multiple choice test from pretest to delayed test. There was no statistically significant difference in scores on the open-ended test for Level 3 students, either. Again, the sample size was too small (n = 9) to draw any conclusion from the data analysis results.

For Level 4 students, there was a statistically significant difference over time in scores on the multiple choice test. There was an increase from pretest to posttest and from pretest to delayed test. However, there was no statistically significant difference in scores from posttest to delayed test. There was a statistically significant difference over time in scores on the open-ended test. There was an increase from pretest to delayed test and from posttest to delayed test. Nevertheless, there was no statistically significant difference in scores from pretest to delayed

test. The sample size of Level 4 participants was still relatively small, $n = 26$; however, the fact that there was statistically significant difference in scores on open-ended test from pretest to delayed test and from posttest to delayed test may suggest that Level 4, the most advanced students in this study, with either traditional classroom teacher-directed instruction or CALL instruction, were more capable of producing grammatically accurate passive sentences.

Conclusions

The mixed design repeated measures factorial MANOVA showed the observable trends across the two experiments were that the *time effect* as well as the *time by level interaction* were statistically significant, but the *time by treatment by level interaction*, the *time by treatment interaction*, the *treatment by level interaction* as well as the *treatment effect*, i.e. the method of instruction, were not statistically significant, which means students' level of English proficiency affected the amount of increase in their scores on the three criterion-referenced measures, i.e., multiple choice, cloze/fill-in-the-blank, and open-ended tests over time regardless of the method of grammar instruction.

In conclusion, the main *treatment effect* comparing the two types of grammar instruction method, i.e., teacher-directed and CALL grammar instruction, was not significant, suggesting there was no statistically significant difference in the effectiveness of the two teaching approaches. We may conclude that CALL grammar instruction was as effective as traditional classroom teacher-directed grammar instruction. Moreover, the finding that showed there was a statistically significant increase in scores on the open-ended test only for Level 4, the most advanced students indicated that advanced students were more capable of producing the passive sentences on their own than those in the intermediate levels.

Discussions of Implications

For both experiments, the main *treatment effect* comparing the two types of grammar instruction method, i.e., teacher-directed and CALL grammar instruction, was not significant, suggesting there was no statistically significant difference in the effectiveness of the two teaching approaches, which may indicate that CALL grammar instruction was as effective as the conventional classroom teacher-directed grammar instruction because there was a statistically significant increase in students' scores on the three measures for both groups from pretest to posttest. To tie-in previous research and review of the literature with findings of this experimental study, the researcher has looked at the following theory to discuss implications of the research findings.

According to interactionist approaches to SLA (Hatch, 1978; Long, 1996), interaction is the most important way in which learners obtain data for language learning. Moreover, Interactionists argued that in addition to manipulation of input through interaction, learners need *opportunities to receive corrective feedback* to be able to better regulate language production or output (Mackey & Gass 2006). The finding of the two methods of instruction having no statistically significant difference may indicate that both traditional classroom teacher-directed group and CALL group had similar quality of *input* of the target structure, i.e., the passive voice (the *Azar* grammar book and the *Azar Interactive* online program contain identical content, charts, and materials) as well as effective *interaction* that are both crucial for the language acquisition process.

It has been argued that corrective feedback plays a beneficial role in facilitating the acquisition of certain L2 grammatical forms, which may be difficult to learn through input alone.

(Sauro, 2009). Because it has been established that corrective feedback is a form of consciousness-raising (Lightbown & Spada 1990; White, Spada, Lightbown, & Ranta 1991), Nagata and Swisher (1995) claim that the computer could provide individualized grammatical consciousness-raising through intelligent corrective feedback. Rosselle, Sercu, and Vandepitte (2009) examined the effectiveness of feedback in a computer-based online learning environment and found that more explicit feedback, combined with adequate depth of processing, led to better learning outcomes and more positive student perceptions. The *Azar Interactive* online program provides learners with explicit and immediate corrective feedback. Students may click on the "check answer" button as soon as they complete the practice exercises to receive explicit and immediate corrective feedback, i.e., the correct answers to the questions. This could be one of the reasons why CALL interaction was as effective as the teacher-to-student interaction in a conventional classroom setting.

Chapelle (2003) indentified three types of basic interaction: interpersonal (between people), intrapersonal (within a person's mind), and that which occurs between a person and a computer (learner-computer). The researcher noticed that students in the CALL group were accustomed to initiate learner-computer interaction when they click on a hypertext link to receive help with comprehension or seek dictionary help. One benefit of learner-computer interaction identified by Chapelle (2003) was that of obtaining enhanced input. Chapelle (1999) suggested that interactions in CALL may be beneficial for language development if they focus learners' attention on input form, allow for modification so learners can focus on input form and meaning, and draw learners' attention to the form of their linguistic output in a way that leads to self-correction (Mills, 2000).

In the present study, there were mainly two types of interactions, i.e. teacher-to-student and student-to-student interactions in the conventional classroom setting. In the CALL instruction setting, the main interaction was learner-to-computer interaction. In addition to the learner-to-computer interaction, when students in the CALL group clicked on the "check answer" button, the immediate corrective feedback they received from the *Azar Interactive* program is also considered to be a main source of computer-to-learner interaction, which, according to the findings of this study, was comparable to teacher-to-student interaction and feedback students may receive from their teachers in the traditional classroom setting.

Most of the instructors in the teacher-directed grammar instruction group hold a Master's in TESOL degree and have many years of teaching experience. The fact that the CALL grammar instruction group performed as well as the teacher-directed grammar instruction group further affirms that CALL grammar instruction can be an effective way of learning grammar. In addition, the results of the current study which showed that CALL grammar instruction was as effective as teacher-directed grammar instruction also indicated that the *Fundamentals of English Grammar Interactive*, i.e., the *Azar Interactive* online program could be as effective for students to learn grammar as using the *Fundamentals of English Grammar* book.

This study has added to the CALL grammar instruction research in the interdisciplinary field of Instructional Technology (IT) and Second Language Acquisition (SLA) and reaffirmed the findings of Nutta's (1996) study. Because the *treatment effect* was not statistically significant, but the *time by level interaction* was statistically significant, all intermediate and advanced students from levels 2, 3, and 4 instructed using the *Azar Interactive* CALL online program performed as well as those instructed by the traditional classroom teacher-directed

grammar instruction. This study has offered a research-based indication that CALL instruction was an effective method for teaching grammar for students of different levels of English proficiency.

Recommendations for Future Research

This study indicated that Computer-Assisted Language Learning (CALL) grammar instruction was as effective as conventional classroom teacher-directed grammar instruction. The finding was noteworthy given the limitations of this experimental study. First of all, the present study was limited in the length of the treatment. This study was conducted at an Intensive English Program (IEP) where the scope and sequence of the grammar classes are predetermined, i.e., to teach one specific grammar structure per week. For instance, the Adjective Clauses, Noun Clauses, Conditional Clauses, Coordinating Conjunctions, Articles, Gerunds and Infinitives, the Passive, and etc. Each form of focus would not be taught for more than five days. Therefore, it would be advisable to extend this experiment with a longer treatment period at different IEPs because five days of instruction on the Passive may have been too short a period of time for students to learn the structure well. It would have yielded better results if the experiment could have lasted longer.

In addition, the researcher recommends for future researchers in the field to replicate this study with more participants taking all three tests, i.e., pretest, posttest, and delayed test. In the present study, 122 students took the pretest, 107 students took the posttest, but only 40 students took the delayed test. The sample size of this study had decreased over time, which could affect the validity of this study. There were seven different instructors from nine classes that participated in the current study. Another suggestion is to control the variable of the instructor in

the traditional classroom teacher-directed group by replicating the present study with one instructor in order to ensure all participants in the teacher-directed group receive the same quality of interaction with one single instructor.

Furthermore, replication of the present research in an English as a Foreign Language (EFL) context is recommended. To replicate this research in an EFL context would allow for the isolation of the method of instruction as the independent variable without interference or concerns with respect to whether or not students are improving at the posttest or delayed test due to their environment and social interaction outside of their formal instruction. For students in an ESL setting, they could probably make gains in their test scores more easily as compared to students in an EFL environment where English is taught as a subject in schools but not used as a medium of instruction in education nor as a language of communication within the country (Richards, et al., 1992), the EFL students may not improve as much from outside of the formal instruction as the ESL students may.

Additional research that replicates the current study by including various types of ESL participants, such as secondary ESL students and vocational ESL students is suggested. Because secondary ESL students may spend the majority of their time at school and in an conventional instruction environment whereas vocational ESL students often have multi-level classes and can enter the course at any point during the year and have open-entry and open-exit enrollment. It would be noteworthy to see if they would benefit from being able to study grammar at their own level and learning pace.

Last but not least, it would be recommendable to design more items on the three measures to be used for future research because with the limited numbers of items on the

multiple choice, cloze/fill-in-the-blank, and open-ended tests, it was difficult to determine if students performed better over time due to the instruction or because of the possibility of them remembering some of the test items on the three measures. Therefore, creating and field-testing more items on the three measures is recommended for future research. Additionally, replication of the present study including a listening comprehension section in the assessment of students' performance is advisable because from the qualitative component of this study, a number of students in the CALL grammar instruction group indicated in their reflections of the *Azar Interactive* online program that the "talking head" and many other listening activities have been very helpful for improving their listening skills. Therefore, the researcher recommends designing a listening comprehension test to assess students' improvement in their listening skills over time and to see the difference in the performance between the teacher-directed grammar instruction group and the CALL grammar instruction group as an extension of the present research.

APPENDIX A: CALL SOFTWARE ASSESSMENT MULTIPLE CHOICE QUESTIONS

Part I Verbs

Directions: *Please choose the correct answer and write the letter a, b, c, or d in front of each question.*

1. A: Did you make your sweater?
   B: It _____ by hand, and a friend gave it to me.
   a. made c. is made
   b. was making d. was made
2. A: Jack looks different.
   B: He _____ his beard.
   a. shaved c. is being shaved
   b. had been shaved d. shaving
3. A: Did Romeo quit his job?
   B: I _____ that he took a leave of absence.
   a. telling c. have told
   b. was told d. tell
4. A: When can I pick up the car?
   B. It _____ by tomorrow afternoon.
   a. should be fixed c. should have fixed
   b. should fix d. should be fixing
5. A: The weather certainly is cold here.
   B: I don't think I'll ever _____ it.
   a. am used to c. get used to
   b. be use to d. got used to
6. A: Why is there such a long line of people?
   B: All passengers _____ before boarding their airplane.
   a. must check c. must be checking
   b. must have checked d. must be checked
7. A. Who are you waiting for?
   B: My mom _____ pick me up in a few minutes.
   a. is supposed to c. supposed to
   b. will supposed to d. supposes to
8. A: How do you like college?
   B: I like living in the dorm, but I _____ the food.
   a. am not use c. didn't used to
   b. am not used to d. didn't use to

APPENDIX B: CALL SOFTWARE ASSESSMENT CLOZE/FILL-IN-THE-BLANK QUESTIONS

Part II Passive vs. Active Completion

Directions: *Complete the sentences with the correct forms (active or passive) of the verbs in the parentheses.*

A community meeting (**hold**)_____last night. People (**ask**)_____by community leaders to discuss several issues. But the community (**want**)_____to discuss only one issue: the construction of a supermall. Developers in the audience (**argue**)_____that it would bring jobs to the town. But most people (**say**)_____ it would destroy the small-town feeling of the community. The discussion (**become**)_____ tense. It was clear that more time (**need**)_____ in the future for discussion of this matter.

Part III –ED v.s. –ING

Directions: *Complete the sentences with the correct adjective provided in the parentheses.*

A: I read an _____(**interested/interesting**) article about the environment yesterday. It says that global climate is gradually getting warmer.

B: I know the one you're talking about. I felt pretty_____ (**discouraged/discouraging**) after reading it. Scientists believe the polar ice cap is melting and oceans could rise. It's kind of _____(**depressed/depressing**) to think about.

A: I know. It says we need to reduce the level of carbon monoxide in the air. But it seems that people here are buying bigger cars and using more gas. It's very_____ (**frustrated/frustrating**) to see huge cars on the freeway with only a driver in them.

B: Perhaps people will be _____(**alarmed/alarming**) enough by the news to change their driving habits.

APPENDIX C: CALL SOFTWARE ASSESSMENT OPEN-ENDED QUESTIONS

Part IV. Sentence Completion

Directions: *Please complete the following sentences using passive grammatical forms. Use as many words as you would like. Please make sure that your answers use correct grammar and that they make sense. Only one complete sentence for each question is required.*

Example:

_____, I drove him to the CMMS.

Because his car was stolen yesterday, I drove him to the CMMS. **OR**

Because his driver license had been suspended, I drove him to the CMMS. **OR**

Because his vehicle has been towed away by the police, I drove him to the CMMS.

Question 1

_____, I picked her up at the airport.

Question 2

In order to travel around the world, _____.

Question 3

_____ before they arrived in Orlando.

Question 4

To enter a movie theater, _____.

Question 5

_____ after the birthday party.

APPENDIX D: CALL SOFTWARE ASSESSEMNT TEACHER DIRECTIONS

Teacher Directions

For the doctoral research entitled "Effects of Computer-Assisted Language Learning (CALL) Instruction on the Acquisition of Passive Grammatical Forms by Post-Secondary English as a Second Language (ESL) Students"

Thank you very much for participating in this study. Please….

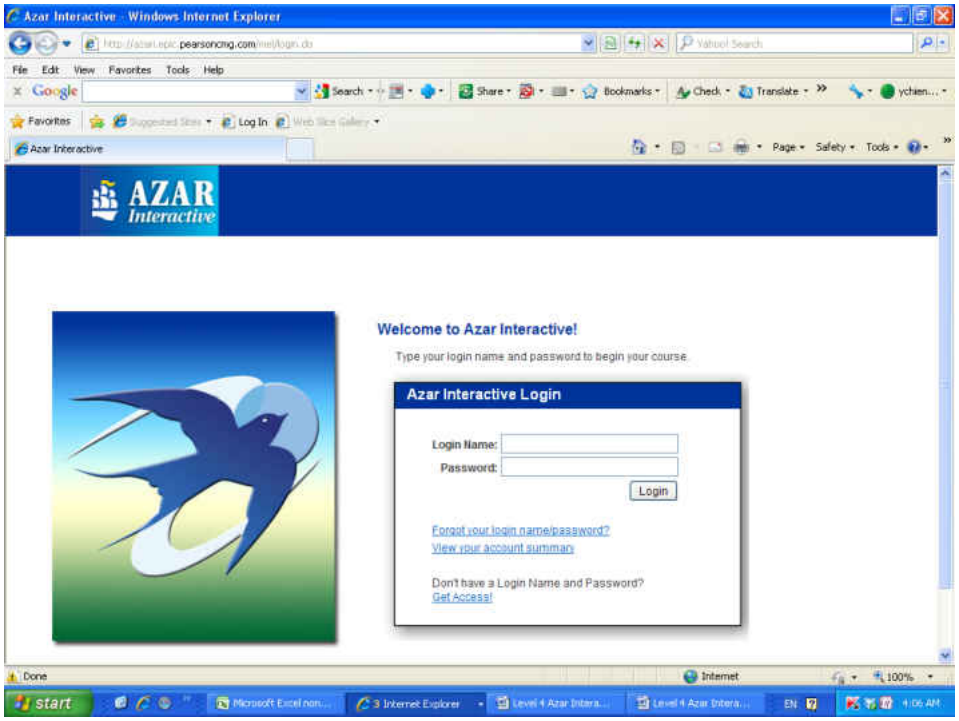
1. Go over the example with the class before the students begin Part IV Sentence Completion (Open-Ended Questions).
2. Make sure that students work independently and without notes or any other materials.
3. The students will take the exact same test three times (pretest, posttest, and delayed test), so please do not discuss the test questions until everyone has turned in her/his second and third test. Please do not provide answer key for the test until after you have collected the posttest and the delayed test.
4. Try to provide the same testing conditions for all three times (pretest/posttest/delayed test) the test is administered.
5. Please inform your students that participation in the pretest and the delayed test will not affect their grades and that student's identity on the tests will remain anonymous.

I appreciate your help and thank you for your contributions to this study. Once the study is completed, I will send you an abstract of the results.

APPENDIX E: STUDY PLAN FOR CALL GRAMMAR INSTRUCTION GROUP

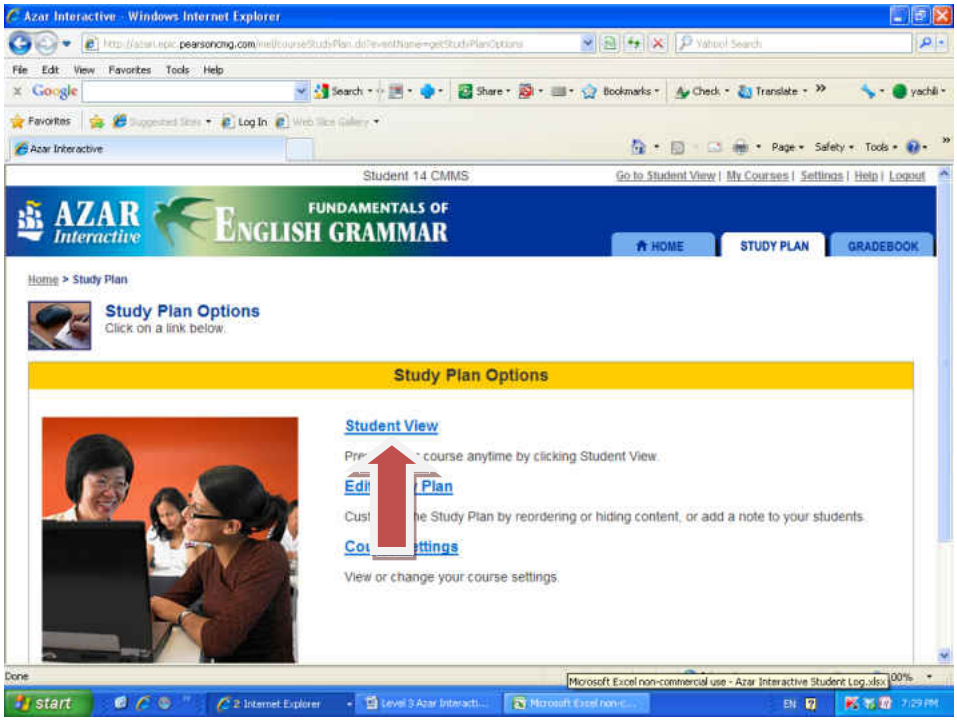
To log onto the Azar Interactive Online Courseware, please go to the link below:

http://azari.epic.pearsoncmg.com/mel/login.do

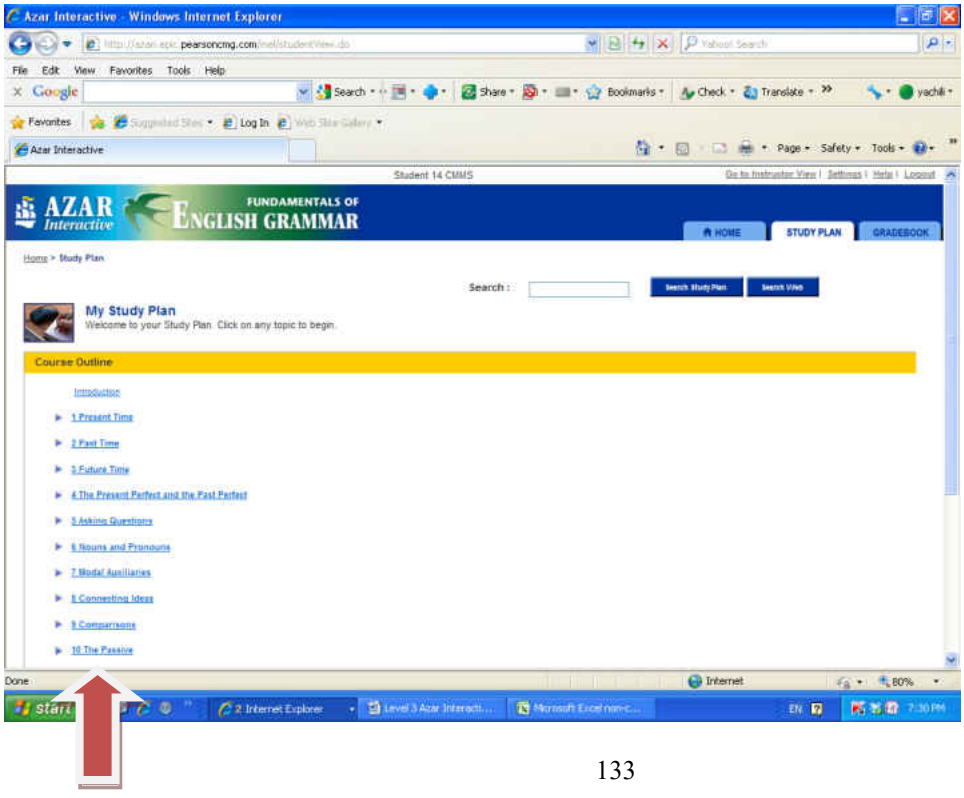


Step 1: Click on the "STUDY PLAN" tab at your upper right-hand corner.

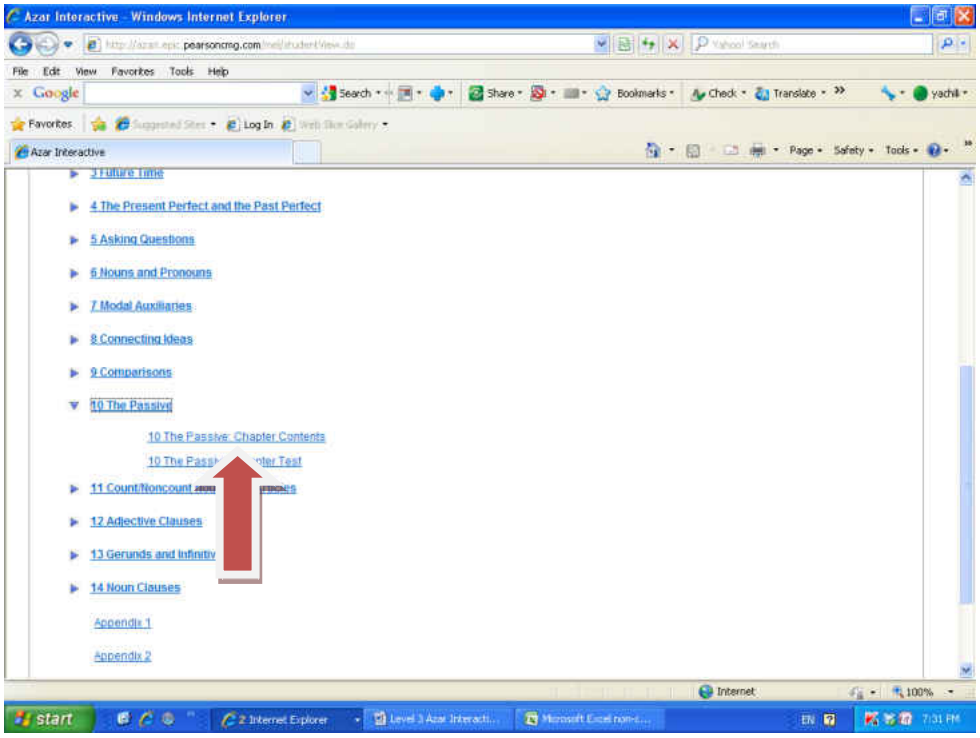
Step 2: Under "Study Plan Options", click on the "Student View" tab.



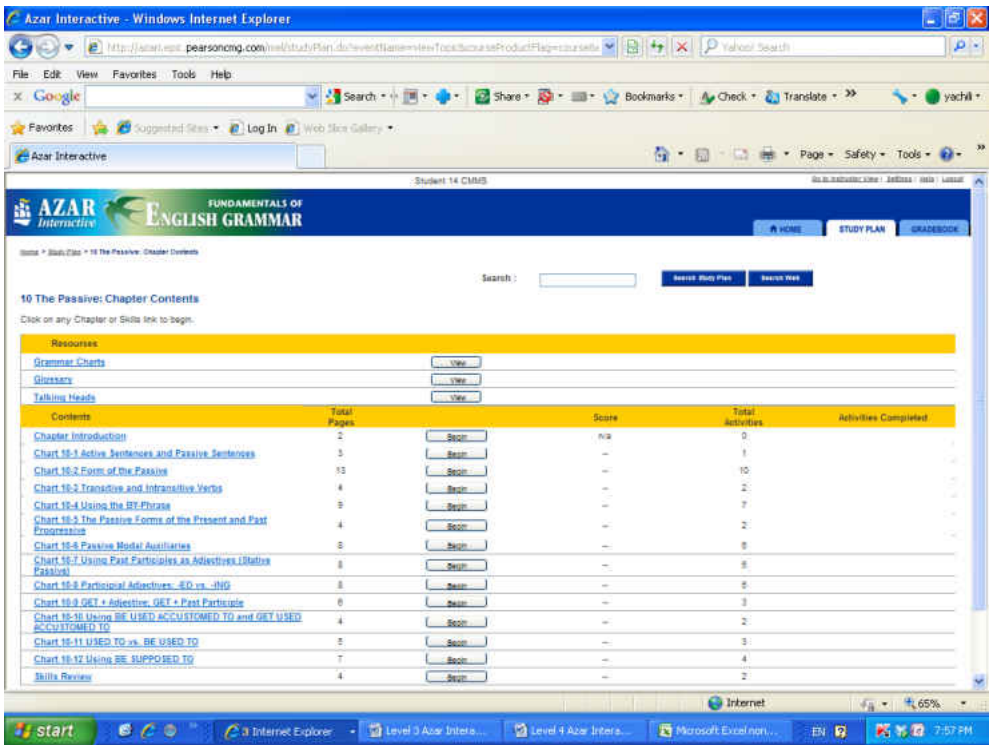
Step 3: Under "My Study Plan", scroll down to the middle of screen and click on "10 The Passive".



Step 4: Click on "10 The Passive: Chapter Contents".



Congratulations! You are now ready to study the Passive grammatical forms! :)



Azar Interactive Online Courseware

Fundamentals of English Grammar Interactive – 10 The Passive

Day 1: Pretest

Day 2: Please complete the following:

Chapter Introduction

Chart 10-1 Active Sentences and Passive Sentences

Chart 10-2 Form of the Passive

(Chart 10-2: Skip Exercise 12. Active vs. passive.)

Day 3: Please complete the following:

Chart 10-3 Transitive and Intransitive Verbs

Chart 10-4 Using the BY-Phrase

Chart 10-5 The Passive Forms of the Present and Past Progressive

Day 4: Please complete the following:

Chart 10-6 Passive Modal Auxiliaries

Chart 10-7 Using Past Participles as Adjectives (Stative Passive)

Chart 10-8 Participial Adjectives: -ED vs. -ING

Day 5: Please complete the following:

Chart 10-9 GET + Adjective; GET + Past Participle

Chart 10-10 Using BE USED ACCUSTOMED TO and GET USED ACCUSTOMED TO

(Chart 10-10: Skip Exercise 45. GET + Past Participle.)

Chart 10-11 USED TO vs. BE USED TO

Day 6: Please complete the following:

Chart 10-12 Using BE SUPPOSED TO

(Chart 10-12: Skip Exercise 54 Using BE SUPPOSED TO.)

Skills Review

(Skill Review: Speaking Activity is Optional.)

10 The Passive: Chapter Test

Day 7: Posttest

Day 21: Delayed Test

APPENDIX F: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Approval of Exempt Human Research

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Ya-Chi Chien**

Date: **March 31, 2011**

Dear Researcher:

On 3/31/2011, the IRB approved the following activity as human participant research that is exempt from regulation:

Type of Review:	Exempt Determination
Project Title:	Effects of Computer-Assisted Language Learning Instruction (CALL) on the Acquisition of Passive Grammatical Forms by Post-Secondary English Language Learner (ELL) Students
Investigator:	Ya-Chi Chien
IRB Number:	SBE-11-07571
Funding Agency:	
Grant Title:	
Research ID:	N/A

This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are made and there are questions about whether these changes affect the exempt status of the human research, please contact the IRB. When you have completed your research, please submit a Study Closure request in iRIS so that IRB records will be accurate.

In the conduct of this research, you are responsible to follow the requirements of the Investigator Manual.

On behalf of Kendra Dimond Campbell, MA, JD, UCF IRB Interim Chair, this letter is signed by:

Signature applied by Joanne Muratori on 03/31/2011 03:50:21 PM EST

Joanne Muratori

IRB Coordinator

APPENDIX G: INFORMED CONSENT FORM

Dear Fellow Students,

This informational sheet is an explanation of my doctoral research. You must be 18 years of age or older to participate in the research. I would like to invite your participation in my study related to *Effects of Computer-Assisted Language Learning (CALL) Instruction on the Acquisition of Passive Grammatical Forms by Post-Secondary English Language Learner (ELL) Students*, a research I am conducting as part of my doctoral studies.

The purpose of this research is to examine the effectiveness of using computer to teach grammar to English Language Learner (ELL) students. I would like you to participate in this experimental research in either the control group, i.e., the teacher-directed group or the experimental group, i.e., the computer-assisted language learning group right here at the Center for Multilingual Multicultural Studies (CMMS) on UCF main campus.

The experimental treatment will last for approximately one week for both groups. Classes will meet from 10:00 a.m. to 10:50 a.m. for seven days. (A Friday before the experimental treatment, and Monday through Friday of one week, as well as Monday of the next week) with the first day (Friday) devoted to completing the pretest and the last, i.e., the seventh day (Monday) devoted to completing the posttest, and a delayed test will be administered two weeks after the posttest.

You will be asked to complete the same pre/post and delayed tests in order to compare and assess your progress before and after the instruction. The pretest, posttest, and delayed test will each take about twenty-five minutes to complete. Prior to the first day of the experiment, study participants in the experimental group will attend a thirty-minute training session which explains how to use the Azar Interactive online software.

Please note that participation in this study is voluntary. There is no benefit, penalty, or impact on grades for participating or not participating in this study and that you may withdraw from the study at any time with no penalty. In addition, if you are assigned to the experimental group and believe that your grade for the chapter test was affected by the mode of instruction, i.e., teacher-

directed or computer-directed instruction, there will be a process for making up any content you did not learn well and retaking the missed questions on the tests. Your identity on the tests will remain anonymous.

If you have any questions regarding this research, please contact me at (407) 823-5515. My faculty supervisor is Dr. Joyce Nutta, Department of Teaching, Learning, and Leadership, (407) 823-4341. Questions or concerns about research participation rights may be directed to the UCF IRB Office, University of Central Florida Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826 or by telephone at (407) 823-2901 or (407) 882-2012.

Please let me know if you would like to participate in this research study. Thank you!

Sincerely,

Ya-Chi Chien
Ed.D. Candidate
Curriculum and Instruction
University of Central Florida
4000 Central Florida Blvd.
Orlando, FL 32816
ychien@mail.ucf.edu

APPENDIX H: PERMISSION FROM PEARSON LONGMAN TO REGISTER FOR THE THIRTY-DAY FREE TRIAL OF AZAR INTERACTIVE ONLINE PROGRAM

Regarding the Azar Interactive online program

From: Crowley, Jill D <Jill.Crowley@pearson.com>
Date: Wed, Mar 30, 2011 at 12:05 PM
Subject: RE: Regarding the Azar Interactive online program
To: Jenny Chien <jchienlin@gmail.com>
Cc: "Wedner, Lori" <lori.wedner@pearson.com>

Hi Jenny,
I spoke to my manager and he said anyone can use the 30 day free trial. We just can't formally register your students. So if you want to do this, it is fine. I would love some feedback after the trial is over.

Thank you,

Jill Crowley
ELL Specialist
Pearson Longman
404-202-2924 cellular
1-888-877-7824 #9130 voicemail
jill.crowley@pearson.com

From: Jenny Chien [mailto: jchienlin@gmail.com]
Sent: Tuesday, March 29, 2011 3:26 PM
To: Crowley, Jill D
Subject: Regarding the Azar Interactive online program

Dear Ms. Crowley,

Good afternoon!

My name is Jenny Chien. I am Dr. Monica Fishkin's colleague here at the Center for Multilingual Multicultural Studies (CMMS) as well as a doctoral candidate at the University of Central Florida in Orlando, Florida. Dr. Fishkin has been working with one of your sales representatives, Ms. Lori Wedner, who is now working for your research department.
Ms. Wedner told me that you are the current representative that I should get into contact with and

provided me with your e-mail address. Ms. Wedner has kindly offered to forward my message to you, and I was wondering if the message has been sent and received.

I will be conducting an experimental study for my dissertation. Approximately 35-50 students will be signing up for the Azar Interactive online program's 30-day trial and use it to participate in my experiment. They will be using the software in their grammar classes for a week (From Monday to Friday, for one hour of grammar instruction per day) and will be going through one specific grammar point during the five-hour instruction period.

The CMMS has been buying a lot of materials from the publisher of the Azar textbooks and software, Pearson Longman. We have been using the Azar textbooks to teach our students grammar for many years. We love the Azar grammar book and are excited about exploring the Azar Interactive online program. Actually, a few of my colleagues have already signed up for the 30-day trial, and I purchased the online version of the Azar Interactive software (both the "Fundamentals of English Grammar" and "Understanding and Using English Grammar") myself. I went through the entire programs and absolutely love them!

We really appreciate the opportunity for our students to register for the Azar Interactive online program's 30-day trial. Although I know everyone can sign up for the 30-day trial, I would like to ask if it would be okay for approximately 35-50 students to sign up for the 30-day trial and use the Azar Interactive online program at the Center for my doctoral research. I know if students at the Center can have access to the Azar Interactive online program and use it to participate in my study, we may one day decide to purchase the online program for our students.

Thank you so very much!

Best Regards,

Jenny

--
Jenny Chien
Doctor of Education Candidate
Curriculum and Instruction
with TESOL Specialization
--
Adjunct Instructor
Center for Multilingual Multicultural Studies
University of Central Florida
4000 Central Florida Blvd.
Orlando, FL 32816-3177
(407) 823-5515
Jenny.Chien@ucf.edu

APPENDIX I: COMPUTER FEATURES OF THE MULTIMEDIA COMPUTER LABORATORY AT THE INTENSIVE ENGLISH PROGRAM

The Multimedia Laboratory (Room 122) at the Intensive English Program (IEP) is fully equipped with the latest technology. All 32 computers run the latest version of Microsoft Windows 7 Professional (64-bit). The specifications of the computers are as follows: The HP Compaq dx2450 Microtower PC (KA546UT) with Compaq S1922 18.5-inch widescreen LCD monitor and genuine Windows Vista Business 32 operating system installed, a processor of AMD Athlon dual-core 4450B, 2.3 GHz, 1 MB L2 cache, HT bus 2.0, and standard memory of 2GB. The internal hard disk drive is 80 GB, the hard disk drive is 80 GB, and the hard disk drive speed is 7200 rpm. The CD-ROM and DVD is 48X SATA DVD/CD-RW combo. Some of the features of the video adapter are as follows: integrated NVIDIA GeForce 6150SE graphics NVIDIA GF 8400 GS (256 MB SH) Single Gead (PCIe x16) ATI Radeon HD 2400 XT (256 MB DH) PCIe x16. The sound system feature is Realtek ALC888S high definition audio codec. The modem is 2006 Agere PCI 56K. The network interface is integrated Realtek RTL8211B 10/100/1000 Ethernet. The external I/O ports are as follows: 2 USB 2.0, 1 microphone in, 1 headphone/line-out, Rear: 4 USB 2.0, 2 PS/2, 1 external VGA monitor, 1 audio in, 1 audio out, 1 RJ-45, 1 microphone in. The keyboard is HP PS/2 Standard Keyboard and the mouse/pointing device is HP USB 2-Button Optical Scroll Mouse.

There are 25 computers in the Computer Laboratory (Room 119) at the IEP. The Computer Lab is fully equipped with the latest technology. All the computers run the latest version of Microsoft Windows 7 Professional (64-bit). The specifications of the computers are as follows: Students will be using HP Pavilion All-In-One MS218 Desktop PC. The computers are equipped with 18.5" LCD display monitor, a base processor of Athlon X2 (B) 3250e 1.5 GHz (22W), 2000 MT/s (mega transfers/second), and Socket AM2. The attributes of memory are as

followed: 2GB memory installed and with 4 GB (2 x 2 GB) (64-bit OS) and 4 GB (2 x 2 GB) (32-bit OS) maximum allowed. The speed is PC2-6400 MB/sec. The hard drive is 250 GB SATA 3G (3.0 Gb/sec) and 7200rpm. The Wireless LAN is 802.11 b/g mini-card. The computers are equipped with integrated high definition audio. Its audio codec is Realtek ALC269. It can support two audio channels through an analog connection. The Network (LAN) is integrated 10/100 Base-T networking interface. The external I/O ports are as follows: There are 2 USB, 1 headphone, and 1 microphone, 2W internal speakers, and web camera. The keyboard is HP USB keyboard and the mouse is HP USB optical mouse.

APPENDIX J: SPSS OUTPUT OF THE MIXED DESIGN REPEATED MEASURES FACTORIAL MANOVA TABLES

Table 3-1

Inter Rater Reliability Coefficient

		Rater1PreOE	Rater2PreOE
Rater1PreOE	Pearson Correlation	1	.999(**)
	Sig. (2-tailed)		.000
	N	122	122
Rater2PreOE	Pearson Correlation	.999(**)	1
	Sig. (2-tailed)	.000	
	N	122	122

Table 3-2

Cronbach's Alpha Internal Consistency/Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.898	.901	5

Table 4-1

Experiment 1 – Multivariate Statistics: Wilks' Lambda for Time and Treatment Effect

Effect			Value	F	Hypothesis df	Error df	Sig.
Between Subjects	Intercept	Pillai's Trace	.972	1137.520(a)	3.000	99.000	.000
		Wilks' Lambda	.028	1137.520(a)	3.000	99.000	.000
		Hotelling's Trace	34.470	1137.520(a)	3.000	99.000	.000
		Roy's Largest Root	34.470	1137.520(a)	3.000	99.000	.000
	Treatment	Pillai's Trace	.043	1.467(a)	3.000	99.000	.228
		Wilks' Lambda	.957	1.467(a)	3.000	99.000	.228
		Hotelling's Trace	.044	1.467(a)	3.000	99.000	.228
		Roy's Largest Root	.044	1.467(a)	3.000	99.000	.228
Within Subjects	Time	Pillai's Trace	.488	31.452(a)	3.000	99.000	.000
		Wilks' Lambda	.512	31.452(a)	3.000	99.000	.000
		Hotelling's Trace	.953	31.452(a)	3.000	99.000	.000
		Roy's Largest Root	.953	31.452(a)	3.000	99.000	.000
	Time * Treatment	Pillai's Trace	.038	1.303(a)	3.000	99.000	.278
		Wilks' Lambda	.962	1.303(a)	3.000	99.000	.278

		Hotelling's Trace	.039	1.303(a)	3.000	99.000	.278
		Roy's Largest	.039	1.303(a)	3.000	99.000	.278

Table 4-2

Experiment 1 – Univariate Statistics: F Statistics on the Three Measures for Time Effect

Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
Time	MC	Sphericity Assumed	67.847	1	67.847	54.176	.000
		Greenhouse-Geisser	67.847	1.000	67.847	54.176	.000
		Huynh-Feldt	67.847	1.000	67.847	54.176	.000
		Lower-bound	67.847	1.000	67.847	54.176	.000
	CF	Sphericity Assumed	42.766	1	42.766	29.840	.000
		Greenhouse-Geisser	42.766	1.000	42.766	29.840	.000
		Huynh-Feldt	42.766	1.000	42.766	29.840	.000
		Lower-bound	42.766	1.000	42.766	29.840	.000
	OE	Sphericity Assumed	26.039	1	26.039	27.056	.000
		Greenhouse-	26.039	1.000	26.039	27.056	.000

		Geisser					
		Huynh-Feldt	26.039	1.000	26.039	27.056	.000
		Lower-bound	26.039	1.000	26.039	27.056	.000
Error(Time)	MC	Sphericity Assumed	126.488	101	1.252		
		Greenhouse-Geisser	126.488	101.000	1.252		
		Huynh-Feldt	126.488	101.000	1.252		
		Lower-bound	126.488	101.000	1.252		
	CF	Sphericity Assumed	144.749	101	1.433		
		Greenhouse-Geisser	144.749	101.000	1.433		
		Huynh-Feldt	144.749	101.000	1.433		
		Lower-bound	144.749	101.000	1.433		
	OE	Sphericity Assumed	97.204	101	.962		
		Greenhouse-Geisser	97.204	101.000	.962		
		Huynh-Feldt	97.204	101.000	.962		
		Lower-bound	97.204	101.000	.962		

Table 4-3

Experiment 1 – Descriptive Statistics (Sample Size, Mean, Standard Deviation) by Group

	Treatment	Mean	Std. Deviation	N
PreMC	Control Group	5.22	2.246	54
	Experimental Group	5.25	2.235	53
	Total	5.23	2.230	107
PostMC	Control Group	6.26	1.729	54
	Experimental Group	6.40	1.573	53
	Total	6.33	1.647	107
PreCF	Control Group	8.8704	2.66562	54
	Experimental Group	8.1462	2.61763	53
	Total	8.5117	2.65451	107
PostCF	Control Group	9.4306	2.04687	54
	Experimental Group	9.2642	2.30667	53
	Total	9.3481	2.17071	107
PreOE	Control Group	1.8889	2.02791	54
	Experimental Group	1.4198	1.74296	53
	Total	1.6565	1.89790	107

PostOE	Control Group	2.3981	2.00737	54
	Experimental Group	2.2830	1.87855	53
	Total	2.3411	1.93631	107

Table 4-4

Box's Test of Equality of Covariance Matrices

Box's M	106.783
F	1.338
df1	45
df2	1529.928
Sig.	.068

Table 4-5

Experiment 2 – Multivariate Statistics: Wilks' Lambda for Time and Treatment Effect

Effect			Value	F	Hypothesis df	Error df	Sig.
Between Subjects	Intercept	Pillai's Trace	.943	177.005(a)	3.000	32.000	.000
		Wilks' Lambda	.057	177.005(a)	3.000	32.000	.000
		Hotelling's Trace	16.594	177.005(a)	3.000	32.000	.000
		Roy's Largest	16.594	177.005(a)	3.000	32.000	.000

		Root					
	Treatment	Pillai's Trace	.019	.212(a)	3.000	32.000	.888
		Wilks' Lambda	.981	.212(a)	3.000	32.000	.888
		Hotelling's Trace	.020	.212(a)	3.000	32.000	.888
		Roy's Largest Root	.020	.212(a)	3.000	32.000	.888
Within Subjects	Time	Pillai's Trace	.640	8.608(a)	6.000	29.000	.000
		Wilks' Lambda	.360	8.608(a)	6.000	29.000	.000
		Hotelling's Trace	1.781	8.608(a)	6.000	29.000	.000
		Roy's Largest Root	1.781	8.608(a)	6.000	29.000	.000
	Time * Treatment	Pillai's Trace	.327	2.347(a)	6.000	29.000	.057
		Wilks' Lambda	.673	2.347(a)	6.000	29.000	.057
		Hotelling's Trace	.486	2.347(a)	6.000	29.000	.057
		Roy's Largest Root	.486	2.347(a)	6.000	29.000	.057

Table 4-6

Mauchly's Test of Sphericity

Within Subjects Effect	Measure	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon(a)		
Time	MC	.975	.829	2	.661	.976	1.000	.500
	CF	.966	1.136	2	.567	.967	1.000	.500
	OE	.993	.243	2	.886	.993	1.000	.500

Table 4-7

Experiment 2 – Univariate Statistics: F Statistics on the Three Measures for Time Effect

Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
Time	MC	Sphericity Assumed	63.082	2	31.541	23.675	.000
		Greenhouse-Geisser	63.082	1.952	32.324	23.675	.000
		Huynh-Feldt	63.082	2.000	31.541	23.675	.000
		Lower-bound	63.082	1.000	63.082	23.675	.000
	CF	Sphericity Assumed	9.383	2	4.691	3.368	.040
		Greenhouse-	9.383	1.935	4.850	3.368	.042

		Geisser					
		Huynh-Feldt	9.383	2.000	4.691	3.368	.040
		Lower-bound	9.383	1.000	9.383	3.368	.075
	OE	Sphericity Assumed	8.907	2	4.453	6.380	.003
		Greenhouse-Geisser	8.907	1.985	4.486	6.380	.003
		Huynh-Feldt	8.907	2.000	4.453	6.380	.003
		Lower-bound	8.907	1.000	8.907	6.380	.016
Error(Time)	MC	Sphericity Assumed	90.594	68	1.332		
		Greenhouse-Geisser	90.594	66.353	1.365		
		Huynh-Feldt	90.594	68.000	1.332		
		Lower-bound	90.594	34.000	2.665		
	CF	Sphericity Assumed	94.723	68	1.393		
		Greenhouse-Geisser	94.723	65.774	1.440		
		Huynh-Feldt	94.723	68.000	1.393		
		Lower-bound	94.723	34.000	2.786		
	OE	Sphericity Assumed	47.469	68	.698		

	Greenhouse-Geisser	47.469	67.506	.703		
	Huynh-Feldt	47.469	68.000	.698		
	Lower-bound	47.469	34.000	1.396		

Table 4-8

Experiment 2 – Descriptive Statistics (Sample Size, Mean, Standard Deviation) by Group

	Treatment	Mean	Std. Deviation	N
PreMC	Control Group	4.53	2.167	15
	Experimental Group	5.20	2.273	25
	Total	4.95	2.230	40
PostMC	Control Group	6.47	1.598	15
	Experimental Group	6.24	1.832	25
	Total	6.33	1.730	40
DelayedMC	Control Group	6.00	2.138	15
	Experimental Group	6.64	1.114	25
	Total	6.40	1.582	40
PreCF	Control Group	9.2000	2.27996	15
	Experimental	8.3400	2.76688	25

	Group			
	Total	8.6625	2.59903	40
PostCF	Control Group	9.0667	2.23100	15
	Experimental Group	9.4500	2.31391	25
	Total	9.3063	2.26207	40
DelayedCF	Control Group	9.1833	2.29609	15
	Experimental Group	9.9300	1.94524	25
	Total	9.6500	2.08689	40
PreOE	Control Group	1.7667	1.88383	15
	Experimental Group	1.5800	1.57738	25
	Total	1.6500	1.67734	40
PostOE	Control Group	2.1667	1.73891	15
	Experimental Group	2.0000	1.72301	25
	Total	2.0625	1.70853	40
DelayedOE	Control Group	2.3167	2.03642	15
	Experimental Group	2.4000	1.76629	25
	Total	2.3688	1.84668	40

Table 4-9

Experiment 1 – Multivariate Statistics: Wilks' Lambda for Time, Treatment, and Level Effect

Effect			Value	F	Hypothesis df	Error df	Sig.
Between Subjects	Intercept	Pillai's Trace	.972	1137.520(a)	3.000	99.000	.000
		Wilks' Lambda	.028	1137.520(a)	3.000	99.000	.000
		Hotelling's Trace	34.470	1137.520(a)	3.000	99.000	.000
		Roy's Largest Root	34.470	1137.520(a)	3.000	99.000	.000
	Treatment * Level	Pillai's Trace	.080	1.381	6.000	200.000	.224
		Wilks' Lambda	.922	1.367(a)	6.000	198.000	.229
		Hotelling's Trace	.083	1.354	6.000	196.000	.235
		Roy's Largest Root	.048	1.588(b)	3.000	100.000	.197
Within Subjects	Time * Level	Pillai's Trace	.247	4.700	6.000	200.000	.000
		Wilks' Lambda	.767	4.670(a)	6.000	198.000	.000
		Hotelling's Trace	.284	4.639	6.000	196.000	.000
		Roy's Largest Root	.176	5.877(b)	3.000	100.000	.001
	Time * Treatment * Level	Pillai's Trace	.057	.982	6.000	200.000	.438
		Wilks' Lambda	.943	.982(a)	6.000	198.000	.439

	Hotelling's Trace	.060	.982	6.000	196.000	.439
	Roy's Largest Root	.055	1.819(b)	3.000	100.000	.149

Table 4-10

Experiment 1 – Univariate Statistics: F Statistics on the Three Measures for Time by Level Interaction

Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Time * Level	MC	Sphericity Assumed	19.944	2	9.972	7.962	.001	.136
		Greenhouse-Geisser	19.944	2.000	9.972	7.962	.001	.136
		Huynh-Feldt	19.944	2.000	9.972	7.962	.001	.136
		Lower-bound	19.944	2.000	9.972	7.962	.001	.136
	CF	Sphericity Assumed	16.331	2	8.166	5.698	.005	.101
		Greenhouse-Geisser	16.331	2.000	8.166	5.698	.005	.101
		Huynh-Feldt	16.331	2.000	8.166	5.698	.005	.101
		Lower-bound	16.331	2.000	8.166	5.698	.005	.101
	OE	Sphericity Assumed	2.262	2	1.131	1.175	.313	.023

		Greenhouse-Geisser	2.262	2.000	1.131	1.175	.313	.023
		Huynh-Feldt	2.262	2.000	1.131	1.175	.313	.023
		Lower-bound	2.262	2.000	1.131	1.175	.313	.023
Error(Time)	MC	Sphericity Assumed	126.488	101	1.252			
		Greenhouse-Geisser	126.488	101.000	1.252			
		Huynh-Feldt	126.488	101.000	1.252			
		Lower-bound	126.488	101.000	1.252			
	CF	Sphericity Assumed	144.749	101	1.433			
		Greenhouse-Geisser	144.749	101.000	1.433			
		Huynh-Feldt	144.749	101.000	1.433			
		Lower-bound	144.749	101.000	1.433			
	OE	Sphericity Assumed	97.204	101	.962			
		Greenhouse-Geisser	97.204	101.000	.962			
		Huynh-Feldt	97.204	101.000	.962			
		Lower-bound	97.204	101.000	.962			

Table 4-11

Experiment 1 – Univariate Statistics: F Statistics for the Three Levels and Three Measures

Level	Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
2	TimeFactor	MC	Sphericity Assumed	66.000	1	66.000	40.615	.000
			Greenhouse-Geisser	66.000	1.000	66.000	40.615	.000
			Huynh-Feldt	66.000	1.000	66.000	40.615	.000
			Lower-bound	66.000	1.000	66.000	40.615	.000
		CF	Sphericity Assumed	20.186	1	20.186	10.665	.003
			Greenhouse-Geisser	20.186	1.000	20.186	10.665	.003
			Huynh-Feldt	20.186	1.000	20.186	10.665	.003
			Lower-bound	20.186	1.000	20.186	10.665	.003
	Error(TimeFactor)	MC	Sphericity Assumed	52.000	32	1.625		
			Greenhouse-Geisser	52.000	32.000	1.625		
			Huynh-Feldt	52.000	32.000	1.625		
			Lower-bound	52.000	32.000	1.625		

		CF	Sphericity Assumed	60.564	32	1.893		
			Greenhouse-Geisser	60.564	32.000	1.893		
			Huynh-Feldt	60.564	32.000	1.893		
			Lower-bound	60.564	32.000	1.893		
3	TimeFactor	MC	Sphericity Assumed	9.766	1	9.766	6.342	.017
			Greenhouse-Geisser	9.766	1.000	9.766	6.342	.017
			Huynh-Feldt	9.766	1.000	9.766	6.342	.017
			Lower-bound	9.766	1.000	9.766	6.342	.017
		CF	Sphericity Assumed	33.063	1	33.063	17.825	.000
			Greenhouse-Geisser	33.063	1.000	33.063	17.825	.000
			Huynh-Feldt	33.063	1.000	33.063	17.825	.000
			Lower-bound	33.063	1.000	33.063	17.825	.000
	Error(TimeFactor)	MC	Sphericity Assumed	47.734	31	1.540		
			Greenhouse-Geisser	47.734	31.000	1.540		
			Huynh-Feldt	47.734	31.000	1.540		

			Lower-bound	47.734	31.000	1.540		
		CF	Sphericity Assumed	57.500	31	1.855		
			Greenhouse-Geisser	57.500	31.000	1.855		
			Huynh-Feldt	57.500	31.000	1.855		
			Lower-bound	57.500	31.000	1.855		
4	TimeFactor	MC	Sphericity Assumed	8.048	1	8.048	11.804	.001
			Greenhouse-Geisser	8.048	1.000	8.048	11.804	.001
			Huynh-Feldt	8.048	1.000	8.048	11.804	.001
			Lower-bound	8.048	1.000	8.048	11.804	.001
		CF	Sphericity Assumed	.583	1	.583	.629	.432
			Greenhouse-Geisser	.583	1.000	.583	.629	.432
			Huynh-Feldt	.583	1.000	.583	.629	.432
			Lower-bound	.583	1.000	.583	.629	.432
	Error(TimeFactor)	MC	Sphericity Assumed	27.952	41	.682		
			Greenhouse-Geisser	27.952	41.000	.682		

			Huynh-Feldt	27.952	41.000	.682		
			Lower-bound	27.952	41.000	.682		
		CF	Sphericity Assumed	38.042	41	.928		
			Greenhouse-Geisser	38.042	41.000	.928		
			Huynh-Feldt	38.042	41.000	.928		
			Lower-bound	38.042	41.000	.928		

Table 4-12

Experiment 1 – Pairwise Comparisons on the Multiple Choice and Fill-in-the-Blank Tests for Time Effect

Level	Measure	(I) TimeFactor	(J) TimeFactor	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
2	MC	1	2	-2.000(*)	.314	.000	-2.639	-1.361
		2	1	2.000(*)	.314	.000	1.361	2.639
	CF	1	2	-1.106(*)	.339	.003	-1.796	-.416
		2	1	1.106(*)	.339	.003	.416	1.796
3	MC	1	2	-.781(*)	.310	.017	-1.414	-.149
		2	1	.781(*)	.310	.017	.149	1.414
	CF	1	2	-1.438(*)	.340	.000	-2.132	-.743
		2	1	1.438(*)	.340	.000	.743	2.132
4	MC	1	2	-.619(*)	.180	.001	-.983	-.255

		2	1	.619(*)	.180	.001	.255	.983
	CF	1	2	-.167	.210	.432	-.591	.258
		2	1	.167	.210	.432	-.258	.591

Table 4-13

Box's Test of Equality of Covariance Matrices

Box's M	106.783
F	1.338
df1	45
df2	1529.928
Sig.	.068

Table 4-14

Experiment 2 – Multivariate Statistics: Wilks' Lambda for Time, Treatment, and Level Interaction

Effect			Value	F	Hypothesis df	Error df	Sig.
Between Subjects	Intercept	Pillai's Trace	.943	177.005(a)	3.000	32.000	.000
		Wilks' Lambda	.057	177.005(a)	3.000	32.000	.000
		Hotelling's Trace	16.594	177.005(a)	3.000	32.000	.000
		Roy's Largest Root	16.594	177.005(a)	3.000	32.000	.000

	Treatment * Level	Pillai's Trace	.077	.439	6.000	66.000	.850
		Wilks' Lambda	.923	.434(a)	6.000	64.000	.853
		Hotelling's Trace	.083	.429	6.000	62.000	.857
		Roy's Largest Root	.081	.895(b)	3.000	33.000	.454
Within Subjects	Time * Level	Pillai's Trace	.702	2.706	12.000	60.000	.006
		Wilks' Lambda	.416	2.657(a)	12.000	58.000	.007
		Hotelling's Trace	1.116	2.604	12.000	56.000	.008
		Roy's Largest Root	.720	3.599(b)	6.000	30.000	.008
	Time * Treatment * Level	Pillai's Trace	.285	.832	12.000	60.000	.617
		Wilks' Lambda	.730	.824(a)	12.000	58.000	.625
		Hotelling's Trace	.349	.815	12.000	56.000	.634
		Roy's Largest Root	.274	1.368(b)	6.000	30.000	.260

Table 4-15

Mauchly's Test of Sphericity

Within Subjects Effect	Measure	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon(a)		
Time	MC	.975	.829	2	.661	.976	1.000	.500
	CF	.966	1.136	2	.567	.967	1.000	.500
	OE	.993	.243	2	.886	.993	1.000	.500

Table 4-16

Experiment 2 – Univariate Statistics: F Statistics on the Three Measures for Time by Level Interaction

Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
Time * Level	MC	Sphericity Assumed	17.477	4	4.369	3.280	.016
		Greenhouse-Geisser	17.477	3.903	4.478	3.280	.017
		Huynh-Feldt	17.477	4.000	4.369	3.280	.016
		Lower-bound	17.477	2.000	8.738	3.280	.050
	CF	Sphericity Assumed	6.565	4	1.641	1.178	.328
		Greenhouse-	6.565	3.869	1.697	1.178	.328

		Geisser					
		Huynh-Feldt	6.565	4.000	1.641	1.178	.328
		Lower-bound	6.565	2.000	3.283	1.178	.320
	OE	Sphericity Assumed	8.211	4	2.053	2.940	.027
		Greenhouse-Geisser	8.211	3.971	2.068	2.940	.027
		Huynh-Feldt	8.211	4.000	2.053	2.940	.027
		Lower-bound	8.211	2.000	4.105	2.940	.066
Error(Time)	MC	Sphericity Assumed	90.594	68	1.332		
		Greenhouse-Geisser	90.594	66.353	1.365		
		Huynh-Feldt	90.594	68.000	1.332		
		Lower-bound	90.594	34.000	2.665		
	CF	Sphericity Assumed	94.723	68	1.393		
		Greenhouse-Geisser	94.723	65.774	1.440		
		Huynh-Feldt	94.723	68.000	1.393		
		Lower-bound	94.723	34.000	2.786		
	OE	Sphericity Assumed	47.469	68	.698		

		Greenhouse-Geisser	47.469	67.506	.703		
		Huynh-Feldt	47.469	68.000	.698		
		Lower-bound	47.469	34.000	1.396		

Table 4-17

Experiment 2 – Univariate Statistics: F Statistics on the Three Measures for Time Effect

Level	Source	Measure		Type III Sum of Squares	df	Mean Square	F	Sig.
2	TimeFactor	MC	Sphericity Assumed	32.133	2	16.067	8.456	.011
			Greenhouse-Geisser	32.133	1.361	23.603	8.456	.026
			Huynh-Feldt	32.133	1.822	17.638	8.456	.014
			Lower-bound	32.133	1.000	32.133	8.456	.044
		OE	Sphericity Assumed	10.000	2	5.000	3.254	.092
			Greenhouse-Geisser	10.000	1.090	9.171	3.254	.140
			Huynh-Feldt	10.000	1.186	8.428	3.254	.134
			Lower-bound	10.000	1.000	10.000	3.254	.146
	Error(TimeFactor)	MC	Sphericity	15.200	8	1.900		

			Assumed					
			Greenhouse-Geisser	15.200	5.446	2.791		
			Huynh-Feldt	15.200	7.287	2.086		
			Lower-bound	15.200	4.000	3.800		
		OE	Sphericity Assumed	12.292	8	1.536		
			Greenhouse-Geisser	12.292	4.362	2.818		
			Huynh-Feldt	12.292	4.746	2.590		
			Lower-bound	12.292	4.000	3.073		
3	TimeFactor	MC	Sphericity Assumed	23.407	2	11.704	4.263	.033
			Greenhouse-Geisser	23.407	1.751	13.365	4.263	.040
			Huynh-Feldt	23.407	2.000	11.704	4.263	.033
			Lower-bound	23.407	1.000	23.407	4.263	.073
		OE	Sphericity Assumed	3.130	2	1.565	1.541	.244
			Greenhouse-Geisser	3.130	1.404	2.230	1.541	.250
			Huynh-Feldt	3.130	1.612	1.941	1.541	.249
			Lower-bound	3.130	1.000	3.130	1.541	.250

	Error(TimeFactor)	MC	Sphericity Assumed	43.926	16	2.745		
			Greenhouse-Geisser	43.926	14.011	3.135		
			Huynh-Feldt	43.926	16.000	2.745		
			Lower-bound	43.926	8.000	5.491		
		OE	Sphericity Assumed	16.245	16	1.015		
			Greenhouse-Geisser	16.245	11.229	1.447		
			Huynh-Feldt	16.245	12.896	1.260		
			Lower-bound	16.245	8.000	2.031		
4	TimeFactor	MC	Sphericity Assumed	15.077	2	7.538	9.363	.000
			Greenhouse-Geisser	15.077	1.897	7.950	9.363	.000
			Huynh-Feldt	15.077	2.000	7.538	9.363	.000
			Lower-bound	15.077	1.000	15.077	9.363	.005
		OE	Sphericity Assumed	4.809	2	2.405	5.719	.006
			Greenhouse-Geisser	4.809	1.541	3.120	5.719	.011
			Huynh-Feldt	4.809	1.623	2.963	5.719	.010

			Lower-bound	4.809	1.000	4.809	5.719	.025
	Error(TimeFactor)	MC	Sphericity Assumed	40.256	50	.805		
			Greenhouse-Geisser	40.256	47.414	.849		
			Huynh-Feldt	40.256	50.000	.805		
			Lower-bound	40.256	25.000	1.610		
		OE	Sphericity Assumed	21.024	50	.420		
			Greenhouse-Geisser	21.024	38.535	.546		
			Huynh-Feldt	21.024	40.578	.518		
			Lower-bound	21.024	25.000	.841		

Table 4-18

Experiment 2 – Pairwise Comparisons on the Multiple Choice and Open-ended Tests for Time Effect

Level	Measure	(I) TimeFactor	(J) TimeFactor	Mean Difference (I-J)	Std. Error	Sig.(a)	95% Confidence Interval for Difference(a)	
2	MC	1	2	-3.000(*)	1.000	.040	-5.776	-.224
			3	-3.200(*)	.490	.003	-4.560	-1.840
		2	1	3.000(*)	1.000	.040	.224	5.776
			3	-.200	1.020	.854	-3.031	2.631

		3	1	3.200(*)	.490	.003	1.840	4.560
			2	.200	1.020	.854	-2.631	3.031
	OE	1	2	-1.000(*)	.306	.031	-1.850	-.150
			3	-2.000	.833	.074	-4.313	.313
		2	1	1.000(*)	.306	.031	.150	1.850
			3	-1.000	1.028	.386	-3.853	1.853
		3	1	2.000	.833	.074	-.313	4.313
			2	1.000	1.028	.386	-1.853	3.853
3	MC	1	2	-1.556	.899	.122	-3.629	.518
			3	-2.222(*)	.641	.008	-3.700	-.745
		2	1	1.556	.899	.122	-.518	3.629
			3	-.667	.782	.419	-2.469	1.136
		3	1	2.222(*)	.641	.008	.745	3.700
			2	.667	.782	.419	-1.136	2.469
	OE	1	2	-.833	.514	.143	-2.018	.351
			3	-.389	.289	.215	-1.055	.278
		2	1	.833	.514	.143	-.351	2.018
			3	.444	.574	.461	-.879	1.768
		3	1	.389	.289	.215	-.278	1.055
			2	-.444	.574	.461	-1.768	.879
4	MC	1	2	-1.000(*)	.254	.001	-1.524	-.476
			3	-.846(*)	.270	.004	-1.402	-.290
		2	1	1.000(*)	.254	.001	.476	1.524

		3	.154	.220	.490	-.299	.606
	3	1	.846(*)	.270	.004	.290	1.402
		2	-.154	.220	.490	-.606	.299
OE	1	2	-.154	.194	.436	-.554	.246
		3	-.587(*)	.210	.010	-1.020	-.153
	2	1	.154	.194	.436	-.246	.554
		3	-.433(*)	.123	.002	-.686	-.180
	3	1	.587(*)	.210	.010	.153	1.020
		2	.433(*)	.123	.002	.180	.686

REFERENCES

Al-Jarf, R.S. (2005). The effects of online grammar instruction on low proficiency EFL college students' achievement. *The Asian EFL Journal Quarterly, 7*(4), 166-190.

Al Jarf, R.S. (2007). Teaching vocabulary to EFL college students online. *CALL-EJ Online, 8*(2). Retrieved from http://www.tell.is.ritsumei.ac.jp/callejonline/journal/8-2/al-jarf.html.

Ariza, E., & Hancock, S. (2003). Second language acquisition theories as a framework for creating distance learning courses. *International Review of Research in Open and Distance Learning*. Retrieved from http://www.irrodl.org/content/v4.2/ariza-hancock.html

Bland, S. K., Noblitt, J. S., Armington, S., & Gay, G. (1990). The naive lexical hypothesis: Evidence from computer-assisted language learning. *Modern Language Journal, 74*, 440-450.

Blomeyer, R. L. (1984). Computer-based foreign language instruction in Illinois schools. *CALICO Journal, 1*(4), 35-44.

Bouziane, A. (2005). Understanding and using English grammar: Interactive. *TESL-EJ, 9*(3), 1-13.

Brown, H. (1994). *Teaching by principles: An interactive approach to language pedagogy.* Englewood Cliffs, N.J.: Prentice-Hall.

Cardenas-Claros, M., & Gruba, P.A. (2009). Help options in CALL: A systematic review. *CALICO Journal, 27*(1), 69-90.

Carroll, S. (2001). *Input and evidence: The raw material of second language acquisition.* Amsterdam: John Benjamins B.V.

Chapelle, C. (1989). Using intelligent computer-assisted language learning. *Computers and the Humanities, 23*(1), 59-70.

Chapelle, C. (1998). Analysis of interaction sequences in computer-assisted language learning. *TESOL Quarterly, 32*(4), 753-757.

Chapelle, C. (1998). Multimedia CALL: Lesson to be learned from research on instructed SLA. *Language Learning & Technology, 2*(1), 21-39.

Chapelle, C. (1999). Technology and language teaching for the 21st century. In J. E. Katchen & Y.N. Leung (Eds.), *The proceedings of the Eighth International Symposium of English Teaching*.

Chapelle, C. (2003). *English Language Learning and Technology*. Amsterdam: John Benjamins.

Chapelle, C. A. (2009). The relationship between second language acquisition theory and computer-assisted language learning. *The Modern Language Journal, 93*, 741-753.

Chapelle & Jamieson (1986). Computer-assisted language learning as a predictor of success in acquiring English as a second language. *TESOL Quarterly, 20*(1), 27-*46.*

Chen, L. (2006). The effect of the use of L1 in a multimedia tutorial on grammar learning: An error analysis of Taiwanese beginning EFL learners' English essays. *The Asian EFL Journal Quarterly, 8*(2), 76-110.

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.

Dooly, M. (2007). Joining forces: Promoting metalinguistic awareness through computer-supported collaborative learning. *Language Awareness, 16*(1), 57-74.

Doughty, C. (1991). Second language instruction does make a difference: Evidence from an empirical study of SL relativization. *Studies in Second Language Acquisition, 13*, 431-469.

Doughty, C. (1992). Computer applications in second language acquisition research: Design, description, and discovery. In M. Pennington & V. Stevens (Eds.), *Computers in applied linguistics: An international perspective* (pp. 127-154). Clevedon, England: Multilingual Matters.

Doughty, C., & Williams, J. (1998). *Focus on form in classroom second language acquisition.* Cambridge, UK: Cambridge University Press.

Dunkel, A., Brill, S., & Kohl, B. (2002). *The impact of self instructional technology on language learning: A view of NASILP*. Retrieved from http://nflrc.hawaii.edu/networks/tr25/tr25-5.pdf.

Ellis, N. (1995). The psychology of foreign language vocabulary acquisition: Implications for CALL. *Computer Assisted Language Learning, 8*, 103-128.

Ellis, R. (1985). *Understanding second language acquisition.* Oxford: Oxford University Press.

Ellis, R. (1993). The structural syllabus and second language acquisition. *TESOL Quarterly, 27*, 91-113.

Ellis, R. (1994). *The study of second language acquisition.* Oxford: Oxford University Press.

Ellis, R. (1995). Modified oral input and the acquisition of word meanings. *Applied Linguistics, 16*(4), 409-35.

Ellis, R. (1999). *Learning a second language through interaction.*Amsterdam: John Benjamins.

Ellis, R. (2002). The place of grammar instruction in second/foreign language curriculum. In E. Hinkel & S. Fotos (Eds.), *New perspectives on grammar teaching in second language classrooms* (pp. 17-34). New Jersey: Lawrence Erlbaum Associates.

Ellis, R. (2008). *The Study of Second Language Acquisition.* Oxford: Oxford University Press.

Felix, U. (2001). Research: Absolutely worth the effort! In U. Felix (Ed.), *Beyond Babel: Language learning online* (pp. 299-365). Melbourne: Language Australia.

Ganem-Gutierrez, G. (2003). Beyond interaction: The study of collaborative activity in computer-mediated tasks. *ReCALL, 15*, 94-112.

Garrett, N. (1982). A psycholinguistic perspective on grammar and CALL. *Modern Media in Foreign Language Education,* 169-196.

Garrett, N. (1988). Computers in foreign language education: Teaching, learning, and language acquisition research. *ADEL Bulletin, 19*(3), 6-12.

Garrett, N. (1991). Technology in the service of language learning: Trends and issues. *The Modern Language Journal, 75*(1), 74-101.

Garrett, N. (2009). Computer-assisted language learning trends and issues revisited: Integrating innovation. *The Modern Language Journal, 93*, 719-740.

Gass, S. (1997). *Input, interaction, and the second language learner.* Mahwah, NJ: Lawrence Erlbaum Associates, Publishers.

Gass, S. (2002). An interactionist perspective on second language acquisition. Kaplan, R.B. (Ed.), *In the Oxford handbook of applied linguistics* (pp. 170-181).

Godwin-Jones, R. (2009). Emerging technologies focusing on form: Tools and strategies.

Language Learning & Technology, 13(1), 5-12.

Gunduz, N. (2005). Computer-Assisted Language Learning (CALL). *Journal of Language and Linguistic Studies, 1*(2), 193-214.

Hanson-Smith, E. (1999). CALL for grammar: Audio, visuals and variety. *ESL Magazines, 2*(4), 20-22.

Hardisty, D. & Windeatt, S. (1998). *CALL.* Oxford: Oxford University Press.

Harris, V. (2003). Adapting classroom-based strategy instruction to a distance learning context. *TESL-EJ,7*(2), 1-16.

Hatch, E. (Ed.). (1978). *Second language acquisition: A book of readings.* Rowley, MA: Newbury House.

Heift, T. (2004). Corrective feedback and learner uptake in CALL. *ReCALL, 16*(2), 416-431.

Hsu, J. (1994). *Computer assisted language learning (CALL): The effect of ESL students' use of interactional modifications on listening comprehension.* Unpublished doctoral dissertation, Iowa State University, Ames, IA.

Hymes, D. (1971). Competence and performance in linguistic theory. In R. Huxley & E. Ingram (Eds.), *Language Acquisition: Models and Methods.* London: Academic Press.

Ittelson, J. (2000). Computers. *Microsoft encarta encyclopedia 2000.* 1993-1999 Microsoft Corporation.

Jamieson, J., & Chapelle, C. (1987). Working styles on computers as evidence of second language learning strategies. *Language Learning, 37*, 523-544.

Jamieson, J., Chapelle, C., & Preiss, S. (2004). Putting principles into practice. *ReCALL,16*(2), 396-415.

Kessler, G, & Plakans, L. (2001). Incorporating ESOL learners' feedback and usability testing in instructor-developed CALL materials, *TESOL Journal, 10*, 15-20.

Kim, D. (2009). *Explicitness in CALL feedback for enhancing advanced ESL learners' grammar skills.* (Doctoral dissertation) Retrieve from ProQuest Dissertations & Theses (PQDT) database.

Kim, H., & Rissel, D. (2008). Instructors' integration of computer technology: Examine the role of interaction. *Foreign Language Annals, 41*(1), 61-80.

Knowles, L. (2004). The evolution of CALL. *Journal of Communication & Education*, 1-38.

Krashen, S. (1981). *Second language learning and second language acquisition.* Oxford: Pergamon.

Krashen, S. (1985). *The input hypothesis: Issues and implications.* New York: Longman.

Kung, S., & Chuo, T. (2002). Students' perceptions of English learning through ESL/EFL Websites. *TESL-EJ, 6*(1).

Lasagabaster, D., & Sierra, J.M. (2003). Students' evaluation of CALL software programs. *Educational Media International, 40*(3/4), 293-304.

Lavine, R. Z. (1992). Rediscovering the audio language laboratory: Learning through communicative tasks. *Hispania, 75*, 1360-1367.

Lee, L. (2005). Using Web-based instruction to promote active learning: Learners' perspectives. *CALICO Journal, 23*(1), 139-156.

Levy, M., & Stockwell, G. (2006). *CALL dimensions: Options and issues in computer-assisted language learning*: Mahwah, NJ: Lawrence Erlbaum.

Lightbown, M., & Spada, N. (1990). Focus-on-form and corrective feedback in communicative

language teaching. *Studies in Second Language Acquisition, 12*, 429-448.

Lightbown, P.M., & Spada, N. (1993). *How languages are learned.* Oxford: Oxford University Press.

Liou, H. C. (1997). Research of on-line help as learner strategies for multimedia CALL evaluation. *CALICO Journal, 14*, 81-96.

Liu, M., Moore, Z., Graham, L., & Lee, S. (2002). A look at the research on computer-based technology use in second language learning: Review of literature from 1990-2000. *Journal of Research on Technology in Education,* 1-54.

Long, M. (1983). Does second language acquisition make a difference? A review of the research. *TESOL Quarterly, 17*, 359-382.

Long, M. (1985). Input and second language acquisition theory. In S. M. Gass & C. G. Madden (Eds.), *Input in second language acquisition* (pp. 377-393). Rowley, MA: Newbury House.

Long, M. (1991). *An introduction to second language acquisition research.* London: Longman.

Long, M. (1996). The role of the linguistic environment in second language acquisition. In W.C. Ritchie & T.K. Bathia (Eds.), *Handbook of research on second language* (pp. 413-468) San Diego, CA: Academic Press.

Long, M. (1997). *Focus on form in task-based language teaching.* Retrieved from http://www.mhhe.com/socscience/foreignlang/top.htm

Lyster, R., & Ranta, L. (1997). Corrective feedback and learner uptake: Negotiation of form in communicative classrooms. *Studies in Second Language Acquisition, 19*, 37-66.

Mackey, A., & Gass, S. (2006). *Second language research: Methodology and design.* Mahwah, NJ: Lawrence Erlbaum Associates.

McCarthy, B. (1994). Grammar drills: What CALL can and cannot do. Paper presented at the Meeting of EUROCALL.

McIsaac, M.S. (1999). *Pedagogy, the internet and the classroom.* Retrieved from http://seamonkey.ed.asu.edu/~mcisaac/paper_artibyte.html.

Merrill, P.F., Tolman, M.N., Christensen, L., Hammons, K., Vincent, B., & Reynolds, P.L. (1986). *Computers in education*. Englewood Cliffs, NJ: Prentice-Hall.

Mills, D. (2000). Web-based technology as a resource for form-focused language learning. *TESOL Quarterly,* 603-615.

Milton, J. (2003). Design principles for an online EFL course. In B. Morrison, C. Green & G. Motteram (Eds.), *Directions in CALL: Experience, experiments and evaluation.* Hong Kong: The Hong Kong Polytechnic University.

Mohamad, F. (2009). Internet-based grammar instruction in the ESL classroom. *International Journal of Pedagogies and Learning, 5*(2), 34-48.

Nagata, N. (1996). Computer vs. workbook instruction in second language acquisition. *CALICO Journal, 14*(1), 53-75.

Nagata, N. (1997). The effectiveness of computer-assisted metalinguistic instruction: A case study in Japanese. *Foreign Language Annals, 30*(2), 187-200.

Nagata, N. (1998). Input vs. output practice in educational software for second language acquisition. *Language Learning and Technology, 1*(2), 23-40.

Nagata, N., & Swisher, M.V. (1995). A study of consciousness-raising by computer:

The effect of metalinguistic feedback on second language learning. *Foreign Language Annals, 28*, 337-347.

Ngu, B., & Rethinasamy, S. (2006). Evaluating a CALL software on the learning of English Prepositions. *Computers & Education*, *47*, 41-55.

Nga, L. (2002). *From chatting to confidence*. Retrieved from http://www.public.iastate.edu/~nkerli/526/CMC.doc.

Nutta, J. (1996). *Effects of CALL instruction on the acquisition of selected grammatical structures by post-secondary ESL students* (Doctoral dissertation). Retrieved from Dissertations & Theses: Full Text.

Nutta, J. (1998). Is computer-based grammar instruction as effective as teacher-directed grammar instruction for teaching L2 structures? *CALICO Journal, 16*(1), 49-62.

Overcast, J. (2007). Fundamentals of English grammar: Interactive. *TESL-EJ, 11*(2), 1-13.

Pienemann, M. (1984). Psychological constraints on the teachability of languages. *Studies in Second Language Acquisition, 6*(2), 187-214.

Pienemann, M. (1989). Is language teachable? psycholinguistic experiments and hypotheses. *Applied Linguistics, 10*(1), 52-79.

Pica, T. (1983). Adult acquisition of English as a second language under different conditions of exposure. *Language Learning, 33*, 465-497.

Pica, T. (1994). Research on negotiation: What does it reveal about second language learning conditions, processes, and outcomes? *Language Learning, 44*(3), 493-527.

Pica, T. (1996). Second language learning through interaction: Multiple perspectives. *Educational Linguistics, 12*(1), 1-22.

Ohta, A.S. (2000). Rethinking interaction in SLA: Developmentally appropriate assistance in the zone of proximal development and the acquisition of L2 grammar. In J.P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 51-78). Oxford: Oxford University Press.

Quinn, R. A. (1990). Our progress in integrating modern methods and computer-controlled learning for successful language study. *Hispania, 73*, 297-311.

Quirk, R., Greenbaum, S., Leech, G., & Svartvik, J. (1985). *A comprehensive grammar of the English language.* London: Longman.

Richards, J., Platt, J., & Platt, H. (1992). *Dictionary of language teaching and applied linguistics.* Essex: University of Cambridge.

Rosselle, M., Sercu, L., & Vandepitte, S. (2009). Learning outcomes and learner perceptions in relation to computer-based feedback. *Indian Journal of Applied Linguistics, 35*(1), 45-61.

Russel, J. (1982). Computers and foreign language instruction. *NALLD Journal, 16*(34), 17-23.

Rutherford, W., & Sharwood-Smith, M. (1985). Consciousness-raising and universal grammar. *Applied Linguistics, 6*, 274-282.

Sauro, S. (2009). Computer-mediated corrective feedback and the development of L2 grammar. *Language Learning & Technology, 13*(1), 96-120.

Savignon, S. (2002). *Interpreting communicative language teaching: Contexts and concerns in teacher education*. London: Yale University Press.

Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In R.W. Schmidt (Eds.), *Attention and awareness in foreign language learning* (pp. 1-63). Honolulu, HI: University of Hawaii, Second

Language Teaching and Curriculum Center.

Shannon, F. (2005). Interactionist theory in second language acquisition. *The Asian EFL Journal Quarterly, 8*(2), 1-12.

Sharwood Smith, M. (1991). Speaking to many minds. *Second Language Research, 7*, 118-132.

Stockwell, G. (2007). A review of technology choice for teaching language skills and areas in the CALL literature. *ReCALL, 19*(2), 105-120.

Son, J.B. (2008).Using Web-based language learning activities in the ESL classroom. *International Journal of Pedagogies and Learning, 4*(4), 34-43.

Soo, K. S., & Ngeow, Y. H. (1996). The English teacher v.s. the multimedia computer: The UNIMAS experience. Paper presented in the 1996 RELC Seminar. Singapore, 22-24 April, 1996.

Swain, M. (1985). Communicative competence: Some roles of comprehensible input and comprehensible output in its development. In S.M. Gass & C.G. Madden (Eds.), *Input in second language acquisition* (pp. 235-253). Rowley, MA: Newbury House.

Swain, M. (1995). Three functions of output in second language learning. In G. Cook & B. Seidlhofer (Eds.), Principle and practice in applied linguistics: Studies in honor of H.G. Widdowson (pp. 125-144). Oxford: Oxford University Press.

Swain, M., & Lapkin, S. (1995). Problems in output and the cognitive processes they generate: A step towards second language learning. *Applied Linguistics, 16*, 371-391.

Swain, M. (1998). Focus on form through conscious reflection. In C. Doughty & J. Williams (Eds.), *Focus on form in classroom second language acquisition* (pp. 64-81).

Cambridge: Cambridge University Press.

Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J.P. Lantolf (Ed.), *Sociocultural theory and second language learning* (pp. 97-114). Oxford: Oxford University Press.

Tsai, R., & Jenks, M. (2009). Teacher-guided interactive multimedia for teaching English in an EFL context. *Journal of Educational Multimedia and Hypermedia, 18*(1), 91-111.

Underwood, J. H. (1993). The lab of the future: Using technology to teach foreign language. *American Association of Community College Journal,* August / September, 33-39.

Vygotsky, L.S. (1978). *Mind in society: The development of higher psychological processes.* Cambridge, MA: Harvard University Press.

Warschauer, M. (2005). Sociocultural perespectives in CALL. In J. Egbert & G. M. Petrie (Eds.), *CALL research perspectives* (pp. 41-52). Mahway, NJ: Lawrence Erlbaum.

White, L., Spada, N., Lightbown, P., & Ranta, L. (1991). Input enhancement and L2 question formation. *Applied Linguistics, 12*, 416-432.

Zhao, L. (1996). *Attitudes of directors of intensive English as a second language programs toward the use of computer-assisted instruction in American universities.* Retrieved from ERIC EBSCOhost.

Zhao, Y. (2003). What should teachers know about technology? Perspectives and practices. *Research Methods for Educational Technology Series.* Retrieved from ERIC EBSCOhost.