EXPLORING THE ROLE OF MULTIMEDIA GLOSSES AND STRATEGY USE IN SECOND LANGUAGE LISTENING COMPREHENSION AND INCIDENTAL VOCABULARY LEARNING IN A MOBILE ENVIRONMENT

FİDEL ÇAKMAK

BOĞAZİÇİ UNIVERSITY

2014

EXPLORING THE ROLE OF MULTIMEDIA GLOSSES AND STRATEGY USE IN SECOND LANGUAGE LISTENING COMPREHENSION AND INCIDENTAL VOCABULARY LEARNING IN A MOBILE ENVIRONMENT

Dissertation submitted to the

Institute for Graduate Studies in the Social Sciences

in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

in

Foreign Language Education

by

Fidel Çakmak

BOGAZIÇI UNIVERSITY
2014

Exploring the Role of Multimedia Glosses and Strategy Use in Second Language Listening Comprehension and Incidental Vocabulary Learning in a Mobile Environment

The dissertation of Fidel Çakmak
has been approved by:

Assoc. Prof. Gülcan Erçetin _____
(Dissertation advisor)

Prof. Yasemin Bayyurt _____

Assoc. Prof. Sumru Akcan _____

Assist. Prof. Senem Yıldız _____

Assist. Prof. Berrin Doğusoy Taylan _____

June 2014

Dissertation Abstract

Fidel Çakmak, "Exploring the Role of Multimedia Glosses and Strategy Use in Second Language Listening Comprehension and Incidental Vocabulary Learning in a Mobile Environment"

This study seeks to investigate the effects of multimedia glosses on second language listening comprehension and incidental vocabulary learning in a mobile environment. The study also explored the strategies used by second language learners as they interacted with listening and multimedia glosses. Based on the multimedia principle of Cognitive Theory of Multimedia Learning (Mayer, 2001), three types of gloss conditions were tested (textual-only, pictorial-only, textual-plus-pictorial). Two other conditions with no glosses included; one of these conditions allowed the learners to regulate their listening through an audio control tool as in the gloss conditions, the other did not allow any kind of control to the learner, except starting the audio file and restarting it. A listening application for mobile devices was developed and optimized for mobile phones. 116 participants with a low-level proficiency level in English were randomly assigned to one of these conditions. To assess their L2 listening comprehension and incidental vocabulary learning, immediate free recall and unannounced vocabulary tests were administered. The participants' interaction with the listening text and glosses was tracked in order to examine the strategies they employed. The findings indicated that access to glosses facilitates recognition and production of vocabulary with the type of gloss having a nonsignificant effect. On the other hand, glosses had no effect on L2 listening comprehension. The results also indicate that when glosses were available, analytical listening strategies were employed more often than global listening strategies. When no glosses were available, students showed an equal tendency for either analytical or global listening. In addition, the participants preferred to use the available glosses simultaneously, i.e. as they interacted with the text. The study concluded that while access to glosses promoted vocabulary recognition irrespective of gloss types, gloss use did not have a significant effect on overall L2 listening comprehension.

Tez Özeti

Fidel Çakmak, "Mobil Ortamda Çoklu Ortam Açıklayıcı Notların ve Strateji Kullanımının İkinci Dilde Dinlediğini Anlama ve Rastlantısal Kelime Öğrenmede Rolünün Araştırılması"

Bu çalışma mobil ortamda, çoklu ortam açıklayıcı notlarının ikinci dilde dinlediğini anlama ve rastlantısal kelime öğrenme üzerindeki rolünü araştırmayı amaçlamaktadır. Aynı zamanda ikinci dil öğrenen bireylerin, ikinci dilde dinleme yaparken ve çoklu ortam açıklayıcı notlarıyla etkileşim içinde bulunduklarında, kullandıkları stratejileri ortaya çıkarmayı hedeflemektedir. Mayer'in (2001) Türetimci Çoklu Ortam Öğrenme Kuramı'ndaki çoklu ortam ilkesine dayanarak üç çeşit açıklayıcı not kullanım koşulu (sadece sözel, sadece görsel, sözel ve görsel) test edilmiştir. Açıklayıcı notların dahil edilmediği iki diğer koşul şöyledir: ses dosyası kontrol sistemi aracılığıyla dinleme metninin kontrolüne izin verilen (esnek) dinleme ve ses dosyasının başlatılması ya da yeniden başlatılması dışında hiçbir kontrole izin verilmeyen dinlemedir. Çalışmayı gerçekleştirmek amacıyla mobil cihazlar için dinleme uygulaması geliştirilmiş, uygulamanın cep telefonlarına yüklenmesiyle erişime açık hale getirilmiştir. Bu koşullardan her birine dil düzeyi düşük seviyede bulunan 116 katılımcı rastgele atanmıştır. Katılımcıların ikinci dilde dinlediğini anlama ve rastlantısal kelime öğrenmelerini değerlendirmek amacıyla anında hatırlama ve önceden haber verilmeden yapılan kelime testleri uygulanmıştır. Aynı zamanda, katılımcıların metin ve açıklayıcı notlar ile etkileşimini değerlendirmek ve ikinci dilde dinleme ve açıklayıcı not kullanım stratejilerini gözlemlemek için katılımcıların uygulama esnasında fiziksel hareketleri ve etkileşimleri kayıt altına alınmıştır. Bulgular gösteriyor ki açıklayıcı notların çeşitlerinin önemli etkisi olmadan, açıklayıcı notlar hatırlamayı ve kelimelerin üretimini kolaylaştırmaktadır. Öte yandan, açıklayıcı notların ikinci dilde dinlediğini anlama üzerinde hiçbir etkisi olmadığı tespit edilmiştir. Bununla birlikte, açıklayıcı notlar sağlandığında, analitik dinleme stratejilerinin evrensel dinleme stratejilerinden daha çok kullanıldığı belirtilmiştir. Açıklayıcı notlar olmadığında ise, katılımcıların analitik ya da evrensel dinleme strateji kullanımlarında eşit eğilim gösterdikleri ortaya çıkmıştır.

Açıklayıcı not kullanım stratejisi olarak, katılımcılar açıklayıcı notları dinleme yaparken eş zamanlı kullanmayı tercih etmişlerdir. Mevcut çalışma, açıklayıcı not çeşitlerinin önemli etkisi olmaksızın, açıklayıcı notlara erişimin kelime hatırlamayı arttırdığını, fakat ikinci dilde dinlediğini anlama üzerinde önemli bir etkisi olmadığını ortaya koymaktadır.

CURRICULUM VITAE

FİDEL ÇAKMAK

EDUCATION

2008 – 2014	Ph.D., Boğaziçi University, Department of Foreign Language Education, Istanbul, Turkey.
2012 Jan. – May	Ph.D. Exchange Program, Georgia State University, Department of Applied Linguistics & ESL, Atlanta, GA, USA.
2003 – 2006	M. A., Mersin University, Department of Foreign Language Education, Mersin, Turkey.
2001 – 2003	M. A., Humboldt-Universität zu Berlin, Center of British Studies, Berlin, Germany.
1996 – 2001	B.A., Boğaziçi University, Department of Foreign Language Education, Istanbul, Turkey.

WORK EXPERIENCE

2003 Dec. – Present	English Language Instructor, Mersin University, Mersin, Turkey
2003 Sept. – Dec.	English Language Teacher, TED College, Mersin, Turkey

PUBLICATIONS

Çakmak, F. (2014). English as a lingua franca: A corpus-based analysis [Review of the book *English as a Lingua Franca: A Corpus-based Analysis*, by L. Prodromou]. *Dicle Üniversitesi Ziya Gökalp Eğitim Fakültesi Dergisi*, *22*, 340-345.

Çakmak, F., & Arap, B. (2013). Teachers' perception of the appropriateness of teacher self-disclosure: A case study from Turkey. *Journal of Teacher Education and Educators*, *2*(2), 275-288.

Çakmak, F. (2010). La formazione dei docenti turco L2: Lo stato dell'arte. In Diadori P. (Ed.), Formazione, qualità e certificazione per la didattica delle lingue moderne in Europa/*TQAC in FLT. Training, quality and certification in foreign language teaching* (pp.191-196). Florence, Italy: Le Monnier.

THESES

Çakmak, F. (2014). *Exploring the role of multimedia glosses and strategy use in second language listening comprehension and incidental vocabulary learning in a mobile environment* (Unpublished Ph.D. dissertation), Boğaziçi University, Istanbul, Turkey.

Çakmak, F. (2006). *The teaching of pronoun resolution mechanism in English and its effect on assigning appropriate referents* (Unpublished master thesis), Mersin University, Mersin, Turkey.

Çakmak, F. (2003). *Gender pay gap in Great Britain: Fact or fiction?* (Unpublished master thesis), Humboldt-Universität zu Berlin, Berlin, Germany.

AWARDS AND HONORS

September 1997 – June 2001	Honors student award by Turkish Education Foundation
June 2001	Honors student award by Boğaziçi University

GRANTS

January 2012 – May 2012	by Georgia State University, Atlanta, GA, USA
September 2001 – June 2003	by Humboldt-Universität zu Berlin, Berlin, Germany
September 1997 – June 2001	by Boğazici University, Istanbul, Turkey

INTERNATIONAL PROJECTS

October 2009- January 2012 - LdV Transfer of Innovation Project: Mobile learning for young people at risk groups [as a researcher] [Reference # 2009-TR1-EO05-08674]
October 2007- November 2009 - LdV Transfer of Innovation Project: Electronic in-service training (e-INSET) for novice English teachers [as a project manager] [Reference # LLP-LdV-TOI-2007-TR-024]

RESEARCH AND TEACHING INTERESTS

Mobile-assisted language learning (MALL), instructional technology, material design and development, second language teaching methods, content and language integrated learning (CLIL)

ACKNOWLEDGEMENTS

First and foremost, I would like to express my deepest thanks for my supervisor, Dr. Gülcan Erçetin. This thesis would not have been completed without her expert guidance and valuable feedback. I have been extremely lucky and blessed to have a supervisor who cares so much about my study and who has always responded to my questions and requests promptly and always made time for me whenever needed. Her kind and warm smile set me at ease whenever we met to discuss the work. During this period, I have felt safe and secure under her careful supervision. I would also like to thank the dissertation committee for their constructive feedback and helpful suggestions.

I am truly grateful to Prof. Yasemin Bayyurt for taking me in as a member of the MLARG Project team through which I found my research direction toward this thesis, and for her encouragement, and understanding during the project period. Thanks to MLARG project funding (Grant No: 2009-TR1-LEO05-08674), mobile devices were provided and made available during the treatment. I am also grateful to Ümit Aslan for his invaluable and constant assistance in developing the mobile application. I owe a very special thank to a friend, Dr. Burak Beyhan, who shared his valuable insights about the content of my thesis, and generously helped me with thesis writing formatting. I also would like to express my thanks to Dr. Berrin Doğusoy Taylan for her valuable remarks on the design of the mobile learning platform, and to Dr. Dönercan Dönük for her inter-rater reliability check.

My special thanks also go to administrators of the faculty I work with, Prof. Bahar Taner and Prof. Hüseyin M. Yüceol, and the administrative staff for their support,

and to the MLARG Project group for their valuable cooperation. I am also grateful for the staff from Boğaziçi University: the academic and administrative staff at FLED, Devrim Baştuğ, Güler Bay, and Nadime Kesir for their welcoming me "home".

My heartfelt thank goes to my dearest friends: Uri Ben Elizer, İbrahim Arap, Marie Therese and her family, Mine Doğucu, Leyla Diana Gücük, Nilüfer Verdi, Helin Al, Filiz Keser Aschenberger, Zeynep Enginel, Mario Arias, Henrike Platz, Uri Stöffler, Carmen Bernal, Janice & Mike Bernhart, Güler Kayabaşı, Derya & Selçuk Uçar, Family Zahoor, Family Alpdoğan, Family Güllü and all of whom were always available when I needed their affection and support. I cannot forget to mention *Pugy*, my adorable puppy, for patiently waiting for me during the long nights next to me, wagging her tail and watching over me affectionately the whole time.

These acknowledgements of course would not be complete without thanking my family, my deceased father, Hüseyin Çakmak, my mum, Lütfiye Çakmak, and my sisters, Eylem Çakmak Gedik and Evrim Civelek, and my beloved for their constant support, love, and care. Their encouragement, love and faith in me always moved me a step further and I did my best not to disappoint them. I would like to express my deep gratitude to my old and beloved friend, Nuray Yel for giving me strength and motivation to keep up the good work and remember me in her prayers. I also thank to my two sisters in spirit, Özge Tümen and Betül Arap for their unconditioned love, emotional support and constant patience at hectic times throughout this study. I also thank to Özge's husband, my dear brother-in-law (*enişte)*, Richard Kemal Webb for his hospitality during my stay at their place in Istanbul.

Last but by no means least, I offer my blessings and thanks to all of those whom I have not mentioned here by name, yet supported me in any respect during the completion of my thesis.

This dissertation was funded by a research grant (Grant No. 6961) from the Boğaziçi University Scientific Research Project Fund and I hereby express my immense gratitude to Boğaziçi University.

DEDICATION

My father was immensely proud that I made the choice to continue along an academic track after I was accepted to a Master's program and would possibly be moving toward a Ph.D. He was a dedicated educator who believed that educating the mind and seeking knowledge empowers us more than the pursuit of material assets. The last time I saw him was before going abroad to fulfill a requirement of the Master's program in Berlin. Although he was sick in bed, he took a few moments to speak with me and was notably more affectionately than usual. He advised strongly that whatever happened to him I should keep up the good work, pursue a Ph.D. and take an academic position in civil service. I promised him that a Ph.D. diploma would be in line after my MA. Diploma and that I would bring it to him one day. I never had the opportunity to fulfill the second part of that promise. I learned in a week after my leaving for Berlin that my father had passed away. For the past six years I have frequently travelled between two different cities (Mersin-Istanbul) in pursuit of that Ph.D. He has been with me in spirit through exhausting travel, late hours, and even sometimes being trapped mid journey due harsh weather conditions or transportation issues. His memory gave me the perseverance to continue with enthusiasm through challenges foreseen and unexpected. When tears of despair filled my eyes at critical moments, the memory of his love and faith helped me to wipe them away and continue. He was an unwavering supporter throughout my life. Now it is time that I fulfill that not so long ago promise for the both of us. So it is with pride and affection that I dedicate this dissertation to my beloved father,

Hüseyin ÇAKMAK
(1943-2002)

CONTENTS

CHAPTER 1. INTRODUCTION 1

Background and the Purpose of the Study 1
Definition of Key Terms 4

CHAPTER 2. MOBILE LEARNING 6

Definition of Mobile Learning 6
Learning Theories Related to m-Learning 10
Challenges of Mobile Learning 13
Design of Mobile Learning 15
Mobile-Assisted Language Learning 23
Previous MALL Studies 29

CHAPTER 3. LISTENING AND INCIDENTAL VOCABULARY LEARNING 35

The State of the Art in L2 Listening 35
The Process of Listening 37
Current Perspectives of L2 Listening 43
Learning Strategies and L2 Listening Comprehension Strategies 49
Incidental Vocabulary Learning 58

CHAPTER 4. GLOSS USE 71

Definition and Advantages of Glosses 72
Previous Studies on Gloss Use in L2 Text Comprehension and Incidental Vocabulary Learning 75
Paper-based Glosses 75
Multimedia Glosses 78
Previous Gloss Studies on L2 Listening 93

CHAPTER 5. METHODOLOGY 99

Research Questions 99
Listening Application 102
Treatment Material 103
Experimental Conditions 105
No-gloss-no-self-regulation Condition 107
No-gloss-self-control Condition 107
Textual-only Condition 108
Pictorial-only Condition 109
Textual-plus-pictorial Condition 110
Participants 111
Data Collection Instruments 112

Free Recall Task 113
Vocabulary Tests 114
Procedure 115
Data Analysis 117

CHAPTER 6. RESULTS 118

Effects of Glosses and Self-regulation on Listening Comprehension 118
Effects of Glosses and Self-regulation on Incidental Vocabulary Learning 119
The Use of Strategies During Listening 122
Listening Strategies 123
Gloss Use Strategies 124
Frequency of Access to Glosses 126
Duration of Listening 127

CHAPTER 7. DISCUSSION 130

CHAPTER 8. CONCLUSION 139

Implications 140
Limitations 142
Future Research 142

APPENDICES 145

A. Listening Text 145
B. Pretest 148
C. Listening Comprehension Test 150
D. Vocabulary Tests 151
E. Frequency of Glossed Word Occurrence 156

REFERENCES 157

TABLES

1. Descriptive Statistics for Recall Scores Across the Five Conditions 119
2. Descriptive Statistics for Vocabulary Tests Across the Five Conditions 120
3. Frequency of Listening Strategies 123
4. Frequency of Gloss Use Strategies 125
5. Frequency of Access to Glosses 126
6. Listening Duration across the Conditions 127

FIGURES

1. A general framework for design principles in mobile learning.....16

2. Continuum and associations between modes of regulation and models of use & participation in a MALL environment. 25

3. Taxonomy of metacognitive and cognitive listening comprehension strategies.....54

4. A screenshot of logging in. 105

5. A screenshot of the instruction before listening the story. 106

6. A screenshot of ending the program. 106

7. A screenshot from the no-gloss-no-self-regulation condition. 107

8. A screenshot from the no-gloss-self-regulation condition. 108

9. A screenshot from the textual-only condition. 109

10. A screenshot from the pictorial-only condition. 109

11. A screenshot from the text-plus-picture-condition. 110

CHAPTER 1

INTRODUCTION

Background and the Purpose of the Study

With the advancement of the Information Age, technology has penetrated almost every aspect of our lives and broadened the space of educational practice through innovative and smart devices, wireless broad-band technology, and innovative application services. This tremendously rapid advancement has led to novel learning methods that are extensions of existing learning theories and has fostered the emergence of a learner-centered and personalized way of learning. With the emerging technologies and growing numbers of multimedia software and mobile applications, language learning has become more authentic, context-aware and ubiquitous. Second language (L2) learners now have unprecedented access to a wide range of authentic texts and multimedia applications with which to develop their L2 skills and learning strategies. Through multimedia support, L2 learners have ample opportunities to receive comprehensible input as well as input enhancement to enhance L2 learners' meaning-making processes. With technological advancements the construction of knowledge with reference to individualized experiences and practice becomes feasible, making the learning process diversely customizable in terms of abilities, interest and preferences.

One of the most comprehensive theories that seek to explain how learning takes place in multimedia environments proposed by Mayer (2001) is *Cognitive Theory of Multimedia Learning (CTML).* According to this theory, the learner receives information through visual and verbal information processing systems where verbal representations

go into the verbal system while visual representations go into the visual system. The theory incorporates three memory stores including sensory memory, working memory and long term memory. Pictures and words come from outside world through a multimedia presentation and go into sensory memory, which allows pictures or printed text to be held for a short time in visual sensory memory and spoken words in auditory sensory memory. When information such as images and sound go into the working memory system, they are held in active consciousness and the information is organized into coherent mental representations as verbal and pictorial models. Finally, the organized verbal and pictorial information are integrated with each other and with relevant existing knowledge from long-term memory. This newly integrated knowledge is stored in long-term memory, which results in learning.

Mayer's (2001*)* CMLT relies on three main assumptions: (1) Humans process separate channels for processing visual and auditory information. (2) Each channel has a limited (finite) capacity in the amount of information that they can process at one time. (3) Learning is an active process of filtering, selecting, organizing, and integrating information with prior knowledge. Humans engage in active learning by attending to incoming information, organizing selected information into mental representations and integrating mental representations with previous knowledge. Based on these assumptions, Mayer (2001) identifies the environment where meaningful learning can occur. In such an environment, "the learner must engage in five cognitive processes: 1) selecting relevant words for processing in verbal working memory 2) selecting relevant images for processing in visual working memory 3) organizing selected words into a verbal mental model 4) organizing selected images into a visual mental model and 5)

integrating verbal and visual representations" (Mayer, 2001, pp. 70-71). Successful and meaningful learning requires that learners coordinate and monitor these five processes. He further lists the principles for designing and using multimedia based on these assumptions, providing a pedagogical ground for learning through multimedia materials. The principles are widely investigated with adult learners in the L1. However, their application to L2 learning is fairly new and there are a limited number of empirical studies investigating whether or not they hold true in L2 learning.

That learning can be facilitated when multimedia technology is incorporated inspires the practice of mobile-assisted language learning. One of the ways to integrate and apply multimedia learning into mobile language learning is by developing multimedia input enhancement (e.g., glosses) based on the principle that people learn better when they are provided with both verbal and pictorial information rather than either mode alone (Mayer, 2001). This principle has been tested with a number of studies on L2 reading comprehension and incidental vocabulary learning through reading. The findings of these studies have confirmed that a combination of verbal and visual glosses is facilitative for L2 reading comprehension and incidental vocabulary learning because it becomes easier to make referential connections with the simultaneous presentation of verbal and pictorial information (Chun & Plass, 1996a; Hong, 2010; Kost, Foss, & Lenzini, 1999). However, their effects on other language skills, particularly on L2 listening, has not been thoroughly investigated. Unfortunately, few empirical studies have investigated the effects of glosses on L2 listening comprehension and incidental vocabulary learning as the by-product of L2 listening. The principal purpose of this study is to contribute to the field not only by investigating

the effectiveness of multimedia glosses (textual-only, pictorial-only and textual-plus-pictorial) on L2 listening comprehension and incidental vocabulary learning but also by carrying out this investigation through the use of mobile phones instead of computers, which is a first attempt in multimedia gloss research. The study also attempts to explore the listening and gloss use strategies of EFL learners by tracking the learners' physical movements as they interact with L2 listening text. This exploration of strategies will elucidate how EFL learners make use of multimedia glosses and what kind of listening strategies they use as they are engaged in listening through a wireless handheld device to construct meaning out of their own learning experiences. The findings of the present study will provide insights about the effects of multimedia glosses on L2 listening and strategy use in a mobile learning environment to MALL content developers and designers, language instructors, and researchers in the field

Definition of Key Terms

Mobile learning (m-learning): In the broadest sense, m-learning is anytime, anywhere learning utilizing mobile devices such as PDAs/iPads, and mobile phones, which are small, autonomous, and ubiquitous with 3G or Wi-Fi functions.

Mobile-assisted language learning (MALL): Language learning through small and portable mobile devices such as PDAs, iPads or tablet computers, MP3s, mobile phones and so forth.

Multimedia learning: Learning new information from spoken/written words and static/dynamic pictures.

Incidental vocabulary learning: Vocabulary learning that occurs unintentionally during the process of reading or listening in second language (L2).

Multimedia: The multiple presentation of learning material with spoken or written words and static/dynamic pictures to promote referential integration of the input.

Annotation/Gloss: A brief definition or synonym or a short explanation of the meaning of a L2 word during reading or listening.

Multimedia annotation/gloss: Annotations/glosses that include multiple modalities such as auditory (sound, spoken text), visual (picture) and textual (word).

Textual annotations: Annotations that present information in the form of words without any pictorial or audio clues.

Pictorial annotations: Annotations that present descriptions or to depict ambiguous or unfamiliar words generally with an illustration that shows the meaning of a word.

Textual-plus-pictorial annotations: Annotations that include both textual and pictorial cues to clarify the meaning of a word.

CHAPTER 2

MOBILE LEARNING

This chapter will present the concept of mobile learning in relation with learning theories, design issues and existing studies. The definition of mobile learning, learning theories relevant to m-learning, and design issues of mobile learning will be explained respectively. Then the concept of mobile-assisted language learning (MALL) will be elaborated, and finally previous MALL studies will be reviewed.

Definition of Mobile Learning

In its early definition, mobile learning, also known as m-learning, was defined as an extension of e-learning through mobile computational devices such as personal digital assistants (PDAs), and mobile phones (Quinn, 2000). It was included with e-learning as a subset of distant learning (Georgiev, Georgieva, & Smrikarov, 2004). Mobile learning case studies and research (O'Malley et al., 2003; Traxler, 2005) have illustrated the benefits of learning opportunities in unfixed settings and times through mobile devices. Mobile learning has been defined as "learning mediated via handheld devices and potentially available anytime, anywhere." (Kukulska-Hulme& Shield, 2008, p. 273) Mobile learning also offers some value added aspects such as adaptability to constantly changing context and its on-demand nature. Additionally, Rosman (2008) defined m-learning as "using mobile technologies (such as mobile phones and hand-held

computers) to enhance the learning process and it involves delivery of digitalized content to either wireless phones hooked into work and education" (p. 120).

Apparently, the development of mobile learning has superseded its association with e-learning by being available at almost any location and time (Kukulska-Hulme & Traxler, 2005). Ebner, Stickel, Scerbakov, and Holzinger (2009) state, "The increased availability of free wireless network access points affect the way that end users interact with ubiquitous devices, extending traditional e-learning into a new phenomenon named: Ubiquitous learning" (p. 34). When compared, e-learning takes place away from the classroom setting and binds learners to static desktop learning, whereas m-learning occurs at an unfixed point and time, focusing on ubiquity and flexibility in time and access. Ubiquity, that is availability everywhere, makes it easier for learners to engage in learning activities outside the formal educational locations. Ubiquity is, of course, possible only with sufficient network capacity, which enables online access to the learning content. The immobile PC and internet connection have limited the potential of e-learning to certain locations such as workplace, classroom or home. However, a wireless mobile device allows learners access information when in transit, or when they are away from hard-wired device. The enhanced accessibility of m-learning allows the learner to access and exploit the material in personally preferred places and times. These two chief attributes, ubiquity and flexibility, make learning more deconstructed allowing the learner greater access regardless of concurrent activities (Corbeil &Valdes-Corbeil, 2007).

In m-learning, learners are given a variety of opportunities to "exploit the spontaneous and opportunistic nature of learning on the move" (Kukulska-Hulme &

Traxler, 2005, p. 31). As the meaning of learning exits the traditional border of fixed educational settings like classrooms and becomes pervasive and on-the-go through hand-held mobile devices, the nature of mobility is reshaped. There are now a variety of mobile learning contexts for each learner/user. Learning can occur while travelling, walking, working, riding a bus; or the context may be hand-free or eye-free learning (Traxler, 2007). Vavoula and Sharples (2002) suggest that learning is mobile in three ways: space, areas of life and time. Learning can occur at work, at home or during leisure time. The learning may be necessary for different areas of life such as training for work, self-improvement or entertainment and it is mobile in terms of time since it can take place at different times of day or even during working days or weekends. Kress and Pachler (2007) regard m-learning as a new cultural practice of learning by the means of mobile device; learners practice and strengthen their understanding and resources while communicating with the world. As mobile devices are fundamentally used for communication with others; learning, that is, meaning-making beyond educational institutions and media use in everyday life, can be integrated into cultural practice and routines in everyday life. Sharples, Taylor, and Vavoula (2007) also define m-learning as "the process of coming to know through conversation across multiple contexts among people and personal interactive technologies" (p. 225). This definition adds cognitive and social dimension to learning through mobile devices. The emphasis is on context through which the users reshape and develop understanding through routine and social collaboration.

Thanks to the advances in technology, m-learning is available through a wide spectrum of mobile devices including: PDAs, mobile phones, small tablets, MP3/MP4

players, iPod touch, e-book readers, IC recorders, games consoles, digital dictionaries, voice recorders and so forth. With varied sizes, designs and operating systems undergoing a rapid innovation serving different needs and tastes, mobile device popularity has grown tremendously, enabling people from all walks of life get connected through various wireless communication technologies such as Bluetooth, Wireless Fidelity (Wi-Fi), 3G or 4G, GPRS and enjoy the small world through mobile devices. Due to the advancement in wireless network communications, these devices become smarter, evolving from being used with limited functions (taking pictures, setting alarm, listening to radio, calculating) to being used with wider functions (surfing the net, connecting to the social networks, gaming, instant messaging and learning applications). By being always-on and serving both as a primary means of social communication and connectivity, "high-end" phones are more often preferred and are popular than the other mobile devices such as tablets or laptops (Attewell, 2005; Lindquist, Denning, Kelly, Malani, Griswold, & Simon, 2007). The portability of mobile phones have made access to information easier and faster (Bradley & Holley, 2011), thus encouraging learners to take part in learning while communicating with others. Due to the high penetration of mobile phones into education and research, theoretical perspectives of m-learning and its effects on learning have been examined (Kukulska-Hulme & Traxler, 2013; Naismith, Lonsdale, Vavoula, & Sharples, 2004; Thornton & Houser, 2005; Traxler, 2009). A new paradigm is emerging to integrate mobile learning through mobile phones to the traditional pedagogy.

Learning Theories Related to m-Learning

To maximize the potential of a mobile device as an aid for learning, it is crucial that the educational experiences be based upon sound educational practice and exploit the 'mobility' of the device extensively. To this end, several international conferences such as MLEARN series and workshops series (the International Workshop on Mobile and Wireless Technologies in Education) and European projects such as HandLer, m-learning, MobiLearn and MLarg have taken place in the field of education. The prerequisites for m-learning as a particular learning type such as 1) identification of uniqueness of m-learning, 2) determination of amount of learning outcomes outside the class, 3) account of practice e.g. learner centeredness, knowledge centeredness, assessment centeredness and community centeredness, and 4) ubiquitous function of personal mobile devices are enlisted for the conceptualization of m-learning (Sharples et al., 2007). Although it is claimed as being "immature in terms of theory and practice of pedagogies" (Traxler, 2007, p. 3), mobile learning along with its outcomes has been explored and discussed in various applications such as collaborative learning (Alvarez, Brown, & Nussbaum, 2011; Pinkwart, Hoppe, Milrad, & Perez, 2003; Zurita & Nussbaum, 2004), teacher training (Seppala & Alamaki, 2003), nurse training (Kneebone, 2005), natural science learning (Chen, Kao, Yu, & Sheu, 2004), institutional training for mobile workers (Lundin & Magnusson, 2003), context-aware language learning (Ogata & Yano, 2004), teachers' professional development (Herrington, Herrington, Mantei, Olney, & Ferry, 2009; Summey, 2013), medicine praxis (Brandt & Rice, 2013; Ranson, Boothby, Mazmanian, & Alvanzo, 2007).

As results and implications of these studies (e.g., Naismith et al., 2004) point out, m-learning as a form of learning has been associated with other established learning theories. Naismith et al. (2004) propose six types of learning related to m-learning: behaviorist, constructivist, situated, collaborative, informal/lifelong, and support/coordination of learning. From a behavioristic perspective, learning should involve a stimulus and be reinforced by a response to a stimulus. Behavioristic learning through mobile devices can be based on quick feedback or the reinforcement element. In constructive learning, learners construct new ideas or concepts by developing their understanding based on a blend of previous and current knowledge. In the case of m-learning, mobile devices can enable individuals constructing meaning through mobile investigations and hands-on experiences. In situated learning, activities within authentic contexts is promoted, so m-learning is promoted or supported in context-specific environment such as museum or field trips. Drawing on those contexts, mobile devices running context-aware applications support the learning activity. In collaborative learning, social interaction is the key point in developing understanding. Learning through mobile devices promotes learning through social participation, interaction and collaboration. For informal and lifelong learning, activities outside of a formal learning environment and formal curriculum are promoted. Through mobile devices, users can have an access to information out of formal educational context when they think it is necessary for them to reach the source of information. As for support of learning, students are provided with informal learning opportunities, which may be intentional or incidental. They might need to access the subject-matter, lecture notes, assignments, quizzes or exams or learn through games and applications when they are enjoying their

pastime fun/activity on mobile devices. Siemens (2005) adds another category of learning activity, namely the theory of connectivism. Connectivism is a blend of behaviorist and constructivist approaches and it suggests that in a networked society, learning takes place in a constantly changing environment and it occurs when specific information sources connect. Learners can see connections between fields, ideas and concepts and manage their own learning by engaging in a network or community. Finally, individualized learning proposed by Cheon, Sangno, Crooks, and Song (2012) refers to the potantial of m-learning to allow learners to manage their own learning pace.

The features of m-learning activities have been decribed by Traxler (2009) as personalized, situated, and authentic. Personalized learning recognizes that learning is personal and adapts to the needs or wants of each individual; the material is developed, delivered or supported based on this recognition. By situated learning, learning takes place in the relevant context such as in the hospital ward (in the case of nurse training), thus supporting learning that is context-specific. Authentic learning involves exploration and inquiry as well as real-life hands-on experiences. Sharples et al. (2009) proposes a framework that presents what distinguishes mobile learning from classroom learning or desktop learning, making it a distinct form of learning. In his framework, there are two dimensions: initiation and management. Learning initiated by the learner himself or the external body (teacher or a curriculum). The process of learning is managed by the learner or others. This framework shows four features of mobile learning. First, mobile learning may be mobile but not necessarily. Learning can occur when learners are outside of or inside of the fixed settings such as lab or classroom where they can use the mobile device.

Second, mobile learning may occur in informal settings. Some supportive informal settings such as museum or field trips may be initiated by the others but managed by the learner. Third, mobile learning may be extended and intertwined with other activities. Mobile learning may support the learner while he or she is engaged in other activities and as a consequence of this, determination of exactly when learning occurs is difficult. Finally, mobile learning may involve both personal and institutional technologies. The number of available technologies and resources such as tablets, e-dictionaries, MP3 players, mobile phones can necessitate that students use either institution-provided mobile devices or compatible individual devices for engaging in learning.

Challenges of Mobile Learning

Although the penetration of mobile learning into education has advanced and been warmly welcomed as an innovation (Sharples et al., 2009) and a new paradigm (Rosman, 2008), m-learning environments bring about various challenges. To illustrate, Naismith et al. (2004) identify challenges such as context, mobility, learning over time, informality and ownership. The mobile learning context is created through user participation. Sometimes this occurs through logging on system with a special password. When a user logs in, the link should be secure to ensure privacy. Mobility capacity does not guarantee support for classroom learning as students might easily engage in activities that are not in line with the curriculum or teaching activity. Furthermore, as learning is varied in time, keeping a log of the mobile learning experience over time is necessary. Informality may create a problem when too much penetration of mobile learning into formal education threatens the social and personal space of learners leading them to abandon using technology for learning. Personal

ownership of mobile devices might create a difficulty for institutional control of the technology as students might go off topic. Like Naismith et al. (2004), Motiwalla (2007) also points out that the length of content delivery and interaction overload are also critical points. According to him, m-learning content delivery should be leveraged with "value added features" such as alerts, discussion or interaction platforms, which can help users use their time more efficiently while on the move. Students in the mobile learning context do not prefer to access material for long periods of time (Dean, 2011). The anytime and anywhere nature of mobile technologies might pose a problem of interaction overload since anytime and anywhere connectivity might put users in danger of being distracted and feeling the chaos of a "24 x 7 headache" (p. 594). Other challenges are also listed by Keough (2005), who has taken the challenge from a pessimistic perspective of the function of m-learning. For him, m-learning is technocentric with the aim of being a mobile device to take part in the market rather than for education. The endpoint of satisfying users with the high-end devices will never be realized. Additionally, little is known about the flow of information and the relationship between users. Last but not least, "mobigogy" is a necessity, that is, teaching and learning models are needed (Keough, 2005, p. 1). Though some extent of pessimism exists, it seems that the world is dynamic and getting smaller. Technology, teaching and the learning culture has taken the direction of adaptation to the innovations. To understand the practice of m-learning and evaluate its outcomes, it is important that there be a comprehensive pedagogical framework for how m-learning can be designed and delivered to learners, which can inform key considerations for the preparation, and application of instructional materials supported by mobile technologies.

Design of Mobile Learning

As mobile learning has become more commonly applied, the design of such learning programs becomes more important. A distinct lack of theoretical framework for mobile learning in its design principles is emphasized (Cochrane, 2012; Sharples et al., 2009). Several studies (Kukulska-Hulme & Traxler, 2013; Quinn, 2013; Parsons, Ryu, & Cranshaw, 2007) have investigated various factors for consideration when designing any m-learning content.

The following is a collective synthesis of the critical factors and principles to be considered in designing mobile learning environments proposed by Killilea (2012), Levert (2006), Mayer (2001), Naismith and Corlett (2006), and Parsons et al. (2007). Based on the work of these researchers, a conceptual framework of mobile learning is developed and illustrated in Figure 1.

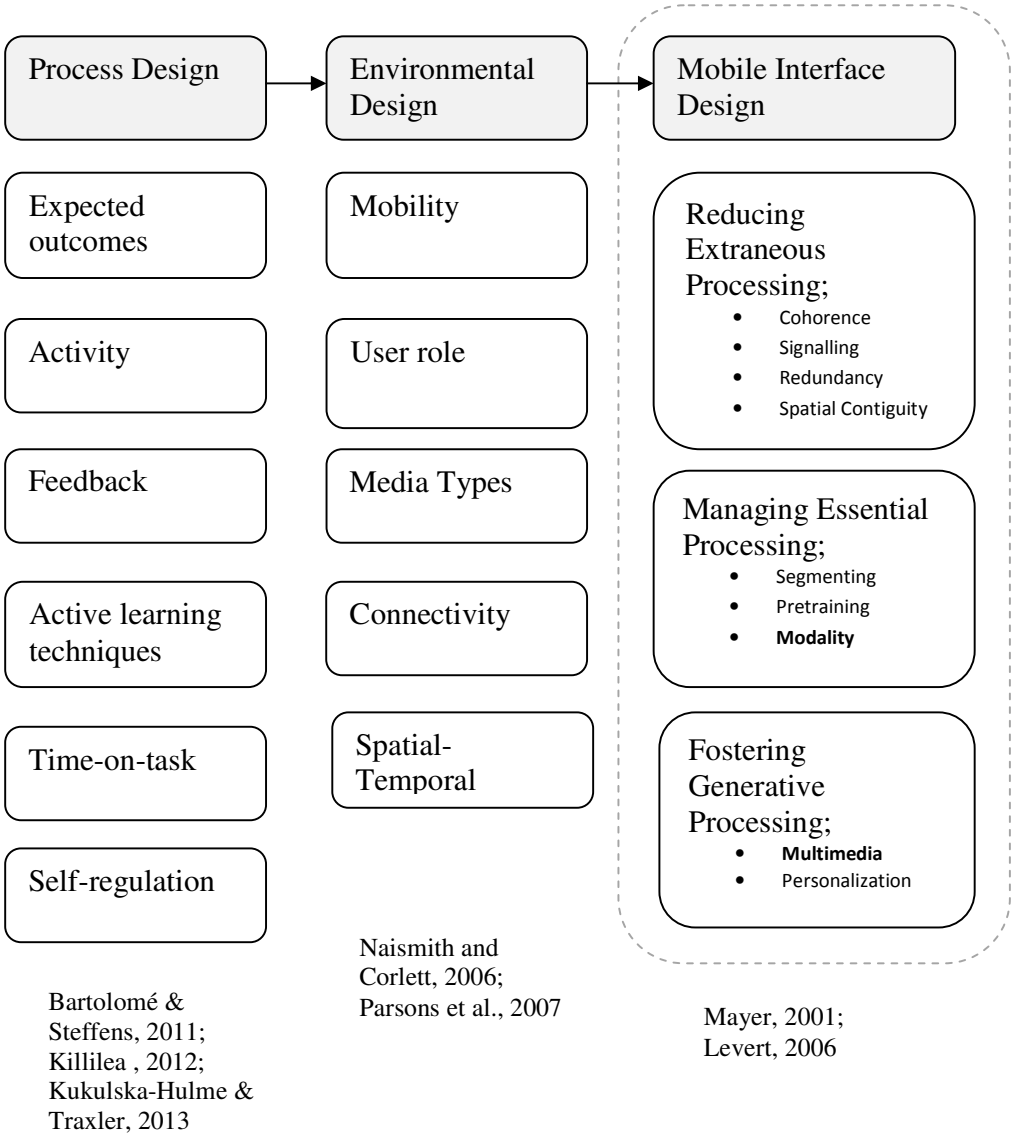


Figure 1. A general framework for design principles in mobile learning

Three design dimensions can be identified: process design, environmental design and mobile interface design. The first dimension, process design, delineates the process by which a learner is recruited and engages in the course of mobile learning. The process design takes into account basic elements such as expected outcomes, activity, feedback,

active learning techniques, time on task and self-regulation (Killilea, 2012; Kukulska-Hulme & Traxler, 2013).

The key points of process design can be listed as follows:

- When designing a mobile learning process for an activity, expected outcomes must be stated clearly so that learners know what they are supposed to do with the m-learning activity or content.
- The activity must involve data searching, testing, consolidation of learning, personal reflection and skill gaining and it should recognize different learning styles.
- Feedback should be built into the content of learning and it should be immediate and constructive.
- Active learning techniques should be integrated in ways that enable learners to internalize learning through different types of data presentation.
- The time-on-task should be considered carefully allowing each learner to be flexible in organizing their learning at their own pace.
- Self-regulation means causal agency, that is, "the capability of individual human beings to make choices and to act on these choices in ways that make a difference in their lives" (Martin, 2004, p. 135). It includes planning for taking part in learning activities as well as time management during the learning process. In a mobile learning environment, this means choosing between different modes of multimedia presentation, and interaction with the available resources, tools and agents. These selections may be made through options (i.e., navigational tools) given to students in a learning environment (Bartolomé &

Steffens, 2011). When designing m-learning, learners' voluntary choices as to organize how and what resources they use must be taken into consideration. This flexibility enables learners to personalize their own learning.

The second dimension, environmental design, addresses accessibility, content specification and user identification. Parsons et al. (2007) approach this dimension from four perspectives including generic mobile environment issues. In terms of generic mobile environmental issues, mobility can be conceptualized differently such as mobility of the user, mobility of devices and mobility of services. Moreover, each user partaking in m-learning may use a given mobile device differently, for example a teenager may use a device for social networking, while professionals might use the same device for business correspondences.

Key Points of Environmental Design:

- The content must be delivered in short units and should be supported with appropriate types of media.
- Spatio-temporal factors involve organizing m-learning activity or interactions time- and location-wise. Some m-learning activities or contexts might be fixed in terms of time and setting while others might be adjustable to the learner's preferences or needs.
- Connectivity refers to wireless network access, through local wireless LAN, or over the mobile telephone networks and it enables the delivery of the content providing access to learning resources. A lack of connectivity can cause disruptions to many mobile activities; therefore, it should be taken into consideration when designing m-learning (Naismith & Corlett, 2006).

The third dimension is mobile interface design. Since, in mobile learning, the presentation mode can be verbal, pictorial, auditory, or mixed, the multimedia learning design principles proposed by Mayer (2001) provide a promising guide for the design of mobile learning environments. Referencing Sweller's (1994) *Cognitive Load Theory* (CLT) dealing with learning and problem solving difficulty, Mayer (2001) integrates different types of cognitive load with his theory of cognitive processing in multimedia learning environments. According to Sweller (1994), there are three types of cognitive load: (1) *Intrinsic cognitive load* is imposed by the basic characteristics of the information rather than by the instructional design. This intrinsic load depends on the complexity of learning material, the preexisting knowledge of learner, and the number of elements to be processed simultaneously in working memory required for learning to take place. (2) *Extraneous cognitive load* is imposed by learning materials. Also described as ineffective cognitive load, it consists of required working memory load which is not directly related to the learning goal (i.e., searching for information to execute a task). (3) *Germane cognitive load* (also termed as effective cognitive load) refers to required tasks that contribute to learning rather than hindering it. When working memory capacity is free from intrinsic and extraneous load, cognitive resources are more efficiently exploited in the acquisition of knowledge and, in turn, learning (Sweller, 1994). As such, Mayer and Moreno (2003) classify three kinds of cognitive processing that learners are engaged in when learning takes place: extraneous cognitive processing (corresponding extraneous cognitive load) caused by confusing instructional design, essential cognitive processing required to represent the material in working memory and influenced by the complexity of material, and generative cognitive

processing required for deeper understanding which can be affected by learner motivation.

Principles for reducing extraneous processing proposed by Mayer (2001):

1. Coherence Principle: People learn better when extraneous material is excluded. For the designs for large displays, it is advisable to remove any distractions (pictures, illustrations, videos, words, music) that are not relevant to the learning content and learning objectives (Levert, 2006).
2. Signaling Principle: People learn better when essential cues or words are highlighted. These cues guide learner's attention and processing during a multimedia presentation. Mobile learning content can be delivered with some essential and relevant cues or words highlighted on the screen to foster learning.
3. Redundancy Principle: People learn better from animation and narration than animation, narration and text. On the mobile device, due to screen size, there is not enough space for lengthy texts without scrolling. Based on both the redundancy principle and the modality principle, it is preferable to have text narrated only. The drawback is that it may take extra time and space to download large audio files to a mobile device (Levert, 2006).
4. Spatial Contiguity Principle: People learn better when corresponding words and pictures are presented close together rather than far apart from each other. On a mobile device, the words and corresponding pictures should be aligned near each other on the screen (Levert, 2006).
5. Temporal Contiguity Principle: People learn better when corresponding narration and animation are presented simultaneously rather than successively. In mobile

learning, popup text or caption labels to illustrate an action or a state depicted in pictures can be used. Clark and Mayer (2008) state that better results can be obtained when feedback is provided on the same page as the exercise or question. It is not advisable to direct a learner to a new window for feedback since separating the elements of learning may hinder learning, creating cognitive overload.

Principles for managing essential processing proposed by Mayer (2001):

1. Segmenting Principle: People learn better when a multimedia presentation is given in user-paced segments rather than as a lengthy and continuous unit. For mobile learning, instructional materials must be organized in a way user can easily manage and control pacing according to his or her preference through the use of a Start/Stop button or Pause button, which yields more effective learning than the material that is presented from beginning to end does (Mayer & Chandler, 2001).
2. Pretraining Principle: People learn better from a multimedia presentation when they already know the names and characteristics of key concepts. The mobile device users can be provided with some fundamental concepts before the course or activity to activate their preexisting knowledge which creates connection and fosters learning. The concepts can be provided in textual, auditory or pictorial modes depending on the content.
3. Modality Principle: People learn better from pictures with spoken text rather than pictures with printed text. Today audio may be integrated into content and delivered by means of mobile devices, (i.e., podcasts). Using audio to deliver

information can economize display capacity for other types of content (text and graphics). Using words in audio format instead of visual text on screen is effective in simultaneous presentation of graphics and words. However, when there is need for memorization of a procedural task or complex formulas, written words may be necessary. The modality principle for m-Learning can manifest itself as using audio instead of text where possible and keeping narration (audio) short and easy to download.

Principles for fostering generative processing proposed by Mayer (2001):

1. Multimedia Principle: People learn better from words and pictures than from words alone. This enables people to make connections between verbal and pictorial data presentations. In mobile learning, this means creating a small chunk of text and pictures as data. However, the screen size limitation of mobile devices and resolution quality of pictures needs to be taken into consideration (Levert, 2006).
2. Personalization Principle: People learn better from a multimedia presentation when words are presented in a conversational style rather than a formal style. On mobile devices, by using first or second person constructions in a m-learning course or activity rather than only third person constructions creates a more conversational style increasing the feeling of social presence. One can also add a direct comment by an agent (animation or video) that is tagged along with the learner during the course of learning. When there is space limitation, an audio agent might work as an alternate to a video agent. The agent should pop up and then hide itself when it is done (Levert, 2006).

These design principles can offer insight or guidelines on how to efficiently optimize and exploit mobile learning in parallel with the goals of a particular implementation.

Mobile-Assisted Language Learning

With the availability of the web and telecommunication technologies and the advent of mobile devices, there has been growing interest in partaking in language learning in a more flexible manner. This approach is known as Mobile-Assisted Language Learning (MALL). MALL has evolved from Computer-Assisted Language Learning (CALL) and m-learning. It differs from CALL for its personal use and portability across different contexts. However, it mirrors m-learning as they both focus on contextualized learning, flexibility and active community participation of the learner. Additionally, MALL exploits key mobile technologies for language learning such as pocket electronic dictionaries, personal digital assistants (PDAs), mobile phones, MP3 players, and tablet PCs (Zhao, 2005, p.447). Research on using these devices for language learning has dominated the MALL literature, with the findings as to how and to what extent language learning is supported with m-learning. It has been shown that these technologies provide a number of “authentic”, “relevant” and “contextual” language learning experiences (Chinnery, 2006, p. 9; Gilgen, 2005, p. 39; Kukulska-Hulme, 2006, p. 123, respectively). Additionally, they provide online environments for learning within a community and sharing resources with others, providing immediate and flexible ways of acquiring a new language (Kukulska-Hulme, 2010).

Language learning has been growing in demand in line with new societal challenges such as the rise of multicultural and multilingual communities and the increase in human mobility (i.e., immigration) due to globalization. The ability to communicate both appropriately and meaningfully with the users of other languages is the principal aim of language learning; however, classic means of learning a language in a predetermined setting and schedule is a limited option. With the intense penetration of technology into our lives, and the popular use of applications running on mobile devices for training, learning and educating, a new digital means (i.e., mobile phones) has integrated mobile learning with language learning. Although there are challenges and design concerns with mobile learning ways of meeting those challenges and concerns are being worked out (Kukulska-Hulme, 2010).

Kukulska-Hulme (2010) has described the concept of MALL within three contexts, the last two of which were also mentioned in the study by Kukulska-Hulme, Traxler, and Pettit (2007): the community as context (i.e., formal and informal education setting), a teacher-driven context ("formally designed") and a learner-driven context ("user-generated"). In each of these contexts, there are the mode of participation (regulated or self-regulated), the model of use (teacher-directed or autonomous), and the model of participation (through specified or proposed teaching activity) through MALL. The concept of MALL can be viewed as a process on the continuum of teacher-driven versus learner-driven learning. The dimensions of language learning, particularly learner participation in the language learning activities and the use of language, are integrated into m-learning on this continuum (see Figure 2).

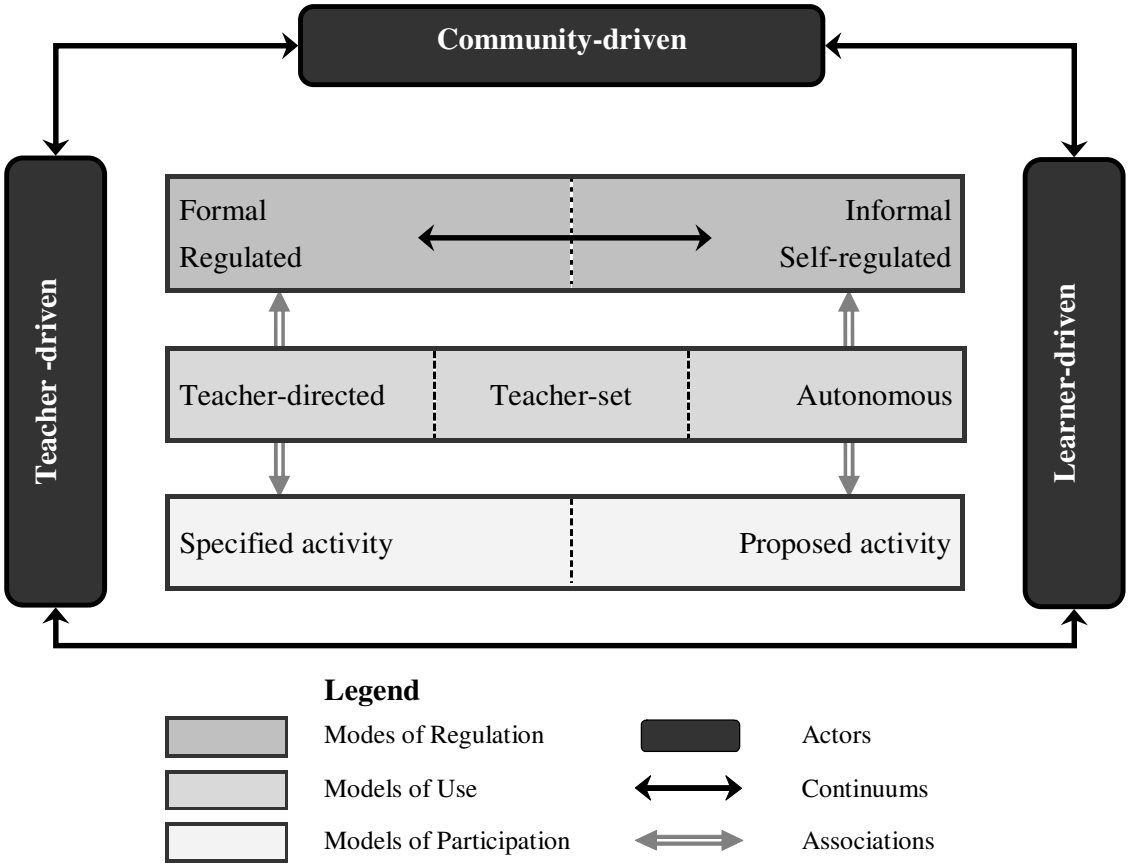


Figure 2. Continuum and associations between modes of regulation and models of use & participation in a MALL environment. Adapted from Kukulska-Hulme et al. (2007), and Kukulska-Hulme (2010).

The MALL programs may employ a number of different learning activities in respect to the learning curriculum. The roles of actors (learners and teachers) in the design of the MALL activities is specified explicitly, and placed on the continuum. Though the interaction among learners in a formal setting is not mentioned in the framework by Kukulska-Hulme (2010) and it is not discreetly visible, the role of other people (i.e., peers, colleagues) in language learning and the effect of social interaction on language learning are undeniable. Because the community basically serves to reinforce language learning through social interactions (i.e., peer-to- peer or groups of learners), the

community-driven dimension is vital in a MALL context where directing or setting up activities can be the responsibility of the peer group rather than of the teacher and learner solely. As community interaction mediates the teaching and learning in MALL context, it takes place on a two-end continuum. In the first dimension in the continuum, there is a blend of formal and informal language learning, where mobile learning opportunities of language learning are provided but with a fluid degree of independence for the learners. The formal language learning requires regulation of the process of learning, whereas, informal learning does not necessitate the regulation by other actors, but by the learner himself only. The process is, therefore, self-regulated and learners are autonomous in their learning of language in general. The model of use is a crucial point to conceptualize in MALL. In the second dimension, there are three models of use in the framework (see Fig. 2). The first model of use is teacher-directed activity, where teachers control pace, time and setting as well as learning objectives and outcomes. Learners are not independent but directed by teachers to participate in MALL activities. This model is associated with formal and regulated learning on the continuum. The teacher-set activity model is the second model of use, where the teacher sets the task and expected outcomes but the process and the outcome depends upon the learner's individual needs, ideas and initiative. The third model of use is autonomous learning activity, where the learners are all free to use a mobile device to learn language content or to be involved in language learning activities based on their own personal interests, and curiosity. This is associated with informal and self-regulated learning on the continuum. In the third dimension, there are two kinds of participation model in a MALL process: specified activity model and proposed activity model. In a specified

activity model, the learner is provided with multimedia materials or interactive exercises for use on their own mobile device or devices provided by the institution. This specification is associated with teacher-led or set activities models. The aim is to encourage learners to learn on their own through a specified and scheduled activity; the drawback is that learners are expected to engage in the activities but there is no certainty that he or she will utilize them fully especially outside of classroom setting. For example, students can listen to a podcast, review the meaning and pronunciation of the words in the text and do the multiple question tests and get the feedback. The setting is of no importance, they can participate at any place at their convenience. In the proposed activity model, participation is not required but supportive for learning and the learners can choose to take part in extracurricular language learning and they may collaborate with others while doing so. An example could be downloading a podcast, listening and doing the related activities and working with others to complete the task. As such, the proposed activity model is associated with both teacher-set and autonomous learning activity models on the continuum.

MALL studies can be categorized in terms of approaches: content and design and learner need. The content-based MALL studies focus on the development of language learning materials and activities. Specifically, they focus on formal context that is relevant to language learning. Certain aspects of language learning through mobile devices have been examined: vocabulary learning via PDAs (Song & Fox, 2008) and language skills such as L2 writing via mobile phones (Li & Hegelheimer, 2013), L2 reading via PDAs (Chang & Hsu, 2011), pronunciation practice (Saran, Seferoğlu, & Çağıltay, 2009) and grammatical accuracy via mobile phones (Baleghizadeh &

Oladrostam, 2010). More content-based MALL studies, particularly on L2 listening and vocabulary learning, are reviewed in the following section in detail. All of these studies noted the effectiveness of using mobile devices to learn second/foreign language, concluding that MALL is a viable option for language learning. However, some of them acknowledge certain limitations such as the small screen sizes of mobile phones and the cost of SMS (Begum, 2011; Clarke, Keing, Lam, & McNaught, 2008), and the lack of oral interaction and collaboration with others (Kukulska-Hulme & Shield, 2008). The focus on content being one-way teacher to student communication, rather than among peers or other groups through MALL is pedagogically traditional even as it encompasses emerging technology. Kukulska-Hulme (2009) proposed taking a "move beyond a superficial understanding of the field and focus more on how mobility, accompanied by digital, location-aware technologies, changes learning". This could be achieved by first investigating how mobile tools are actually used by learners in the learning process (Stockwell, 2010), and how the learners` needs are taken into account when creating content (Bayyurt & Karataş, 2011).

The design and learner needs approach is taken into account and acknowledged in some studies. These studies are different from those with a content-based approach, where students are provided materials designated by teachers. Rather, these studies focus on students` active participation in L2 language learning. A study on personalized MALL conducted by Chen and Hsu (2008) is an example of personalized language learning for the promotion of reading skills in L2. They propose a personalized intelligent mobile learning system (PIMS) which can estimate learners` reading abilities individually and then recommend appropriate English news articles to the individual

learners based on their feedback responses. Unknown vocabulary in the articles can then be explored automatically. The study confirmed that matching the articles according to the proficiency of the students and providing unknown vocabulary to the learners in context promotes learners` L2 reading comprehension. Two other examples of a learner-generated vocabulary content in an authentic environment have been given by Wong and Looi (2010), and Hasegawa, Ishikawa, Shinagawa, Kaneko, and Mikakoda (2008). They have reported the learning effects from learners` augmenting their own vocabulary learning by using their favorite images or movies with their peers. Student-created materials ensure authenticity and social collaboration for learning, and foster language learning through individual and social contexts. There should be more work to improve student motivation and instill enthusiasm to create their own materials either on their own or with peers. Challenges of the design and learner needs approach included students' accepting the new patterns of learning (Stockwell, 2008) and learners' lack of preparedness for autonomous language learning (Hoven & Palalas, 2011).

Previous MALL Studies

There have been a number of MALL studies published over the last decade. These studies have exploited various mobile devices such as handheld devices, cell phones, mobile phones, PDAs, smartphones, and mobile applications targeted towards language learning. MALL research has explored the effectiveness of mobile language learning in relation to: the effects of short-term memory and content representation on MALL (Chen, Hsieh & Kinshuk, 2008), users' attitudes towards experience with MALL (Nah, White, & Sussex, 2008), enhancement of language learning by the use of supportive

mobile devices (Allan, 2008; Brown, Castellano, Hughes, & Worth, 2012; Gabarre &Gabarre, 2010; Gromik, 2012; Palalas, 2009; Palalas, & Olenewa, 2012), collaborative learning (Lan, Sung & Chang, 2007; Lin, Liu, & Niramitranon, 2008), the use of mobile phones for the oral assessment of speaking skill (Cooney & Keogh, 2007; Demouy, Eardley, Shrestha, & Kukulska-Hulme, 2011), the design of MALL for English for Specific Purposes (Hoven & Palalas, 2011), model design for applications for L2 English learners (Ruan & Wang, 2008), use of iPad applications for young learners (Yıldız, 2012) and the effect of MALL on grammatical accuracy (Baleghizadeh & Oladrostam, 2010; Liu & Chen, 2012). A remarkable volume of MALL studies focus on language skills and vocabulary learning. For example, a volume of studies exist on: the positive effect of MP3 L2 English lessons on oral skill development (Al-Jarf, 2012), the descriptive specifications of speaking activities on mobile phone for improving English speaking skills (Tuttle, 2013) the effectiveness of web-based translation-annotation application on PDAs for improving L2 English reading comprehension (Chang & Hsu, 2011; Hsu, He, & Chang, 2009), the use of mobile devices to facilitate writing sentences including providing vocabulary, sample sentences, phrases (Hwang, Chen & Chen, 2011), use of iPod for reading fluency (Papadima Sophocleous, Georgiadou, & Mallouris, 2012).

The studies on vocabulary learning have focused on the comparison of e-dictionaries and paper dictionaries in terms of reading comprehension and vocabulary retention (Kobayashi, 2008; Koyama & Takeuchi, 2004, 2009), spelling exercises and teaching pronunciation through mobile phones (Butgereit & Botha, 2009; Saran, Seferoğlu, & Çağıltay, 2009; Zhang, 2012), the effect of using SMS versus printed

dictionary on academic vocabulary retention (Alemi, Sarab, & Lari, 2012), learning idioms through mobile phones (Amer, 2010), the effect of SMS on learning collocations (Motallebzadeh, Beh-Afarin, & Daliry Rad, 2011), vocabulary learning through SMS versus traditional flashcards (Azabdaftari & Mozaheb, 2012; Başoğlu & Akdemir, 2010), the affective role of mobile phones in language learning (Clarke, Keing, Lam, & McNaught, 2008; Çavuş & İbrahim, 2008; Kennedy & Levy, 2008; Song, 2008). Of these studies, Kim (2011) examined the effects of text messaging and interactivity on vocabulary learning with 62 undergraduate Korean students learning English as L2. While the control group received only-classroom instruction, one of the experimental groups received SMS with no interactivity, the other received SMS with interactivity. The experiemental groups outperformed the control group in terms of vocabulary scores, with the group that received interactive SMS performing better than the one receiving noninteractive SMS. Despite positive effects of text messaging on vocabulary learning, the studies conducted by Lu (2008), and Zhang, Song, and Burston (2011) suggest that vocabulary gains of learners could be short term. Zhang et al. exposed one group of students to printed version of words (available to the students any time they wished) and another group to text messages twice a day for a month The SMS group outperformed the group exposed to the printed words on the immediate vocabulary retention test. However, the delayed test scores of the groups were not significantly different. Lu (2008), in a study with within groups design, also observed immediate gains in favor of the SMS group but nonsignificant delayed scores.

As for MALL studies that examined listening comprehension, Chen and Chang, (2011) focused on the effects of content presentation modes (either listening with auditory

message only, or listening with auditory and written messages) and proficiency on listening comprehension. 162 students at tertiary level were randomly assigned to either single mode (spoken message only) or dual mode (spoken message with identical written text) study groups. They then took a field trip with their PDAs and observed four animals while listening to an audio guide in English. This provided content-based, situated language learning through the use of mobile learning on PDAs. After listening to the texts, participants were directed to take the comprehension test involving five multiple choice questions. The results indicated that the students in the dual mode presentation comprehended the texts better than those limited to a single mode presentation regardless of their L2 proficiency levels. Chen and Chang (2011) conducted a study with 162 Taiwanese university students to examine whether the modality effect of content presentation modes on cognitive load and listening comprehension depends on the moderating effect of the learners' language proficiencies in a mobile learning context. Students were assigned to one of two presentation modes: a single mode with auditory-only input and a dual mode with audio-plus-textual input. A comprehension test and cognitive load rating scale were administered. The results indicated a moderating role of English proficiency on cognitive load: students with lower English proficiency appeared to be more attentive to the text. That means, they benefit from the written text to reduce cognitive load. On the other hand, no moderating effect was found on task performance in that students in the dual mode outperformed the students in the single mode group across proficiency levels.

Demouy and Kukulska-Hulme (2010) investigated students' language learning experiences with their own portable devices for additional listening and speaking

practice within a course. They were interested in whether there were any differences between the ways in which students used audio players (iPods/MP3 players) and mobile phones for listening and speaking practice. Two groups of 35 students at the tertiary level were formed (one group using iPod/MP3 players, the other using mobile phones). This support program lasted 6 weeks and each week groups were asked to complete an online questionnaire about their skill learning through mobile devices. It was found that the use of iPods and MP3 players was quickly adopted for listening and speaking practice. On the other hand, the use of mobile phones presented some technical challenges such as the functionality of mobile phones, sound quality, and difficulties with navigation.

Demouy and Kukulska-Hulme (2010) argue that the use of mobile devices can facilitate L2 listening and speaking skills and that some learners might need assistance with comprehending the value and challenges of skill learning through mobile devices. Nah, White, and Sussex (2008) examined a group of undergraduate Korean students' attitudes about using a mobile phone to access wireless application protocol (WAP) sites for L2 listening comprehension. They found positive attitudes towards the use of the WAP site and indicated that these sites can be supportive not only for listening comprehension but also collaborative language learning. Similarly, Reinders and Cho (2010) reported the enthusiasm that undergraduate students had for engaging in L2 extensive listening practice outside the class through podcasts downloaded on their mobile phones. The students stated various reasons as to why they were motivated to take part in such learning: because they did not feel pressured to take part, time and place were flexible, because it was an exciting experience, and they liked the

opportunity to access English on-the-go: travelling on the bus; or spending time with friends.

As can be seen from the above mentioned studies, MALL studies are being published with increasing frequency. The present study aims to contribute to the field of MALL research with its comprehensive and empirical focus on the effect of glosses on a long-ignored second language skill, L2 listening, and incidental vocabulary learning through listening in a mobile learning environment.

CHAPTER 3

LISTENING AND INCIDENTAL VOCABULARY LEARNING

This chapter will present the theoretical background for second language (L2) listening and incidental vocabulary learning. The state of the art in L2 listening, the process of listening, perspectives on L2 listening, learning strategies and L2 listening comprehension strategies will be portrayed respectively and then, incidental vocabulary learning will be addressed.

The State of the Art in L2 Listening

The importance of listening in second language learning has not been given its due for a long time. In the early 1960s, due to the popularity of audio-lingual methodology, many second language programs placed a primary emphasis on the development of speaking skills through imitations of dialogues and repetitions of oral drill practices. These practices focused on accuracy of pronunciation to enable better communication. The main listening activities were drills for discriminating sounds at word and sentence levels. As a result of this emphasis on spoken texts, listening skills were neglected and the act of listening was viewed as a passive receptive process until mid-1970s. The approach to listening was based on a paradigm where the listener is the receiver of a 'message' from a 'sender' in a transmitting system. With the work of Krashen on comprehensible input in language, an interest in comprehension-based methodologies arose in the late 80s. Krashen (1981) claims that comprehensible input is the key source of acquisition of the structure and vocabulary of the target language and that exposure

enables learners produce the target language naturally. Listening has generally been regarded as a crucial component of second language acquisition (Feyten, 1991). However, the classification of listening as passive receptive skill endured until more recent research associated active mental processes with comprehension (Johnson, 2008; Vandergrift, 2011). Over the last twenty years the role of active processing of what is being heard, that is to say, the mediation between sounds (what they get from visual and auditory clues) and construction of meaning (how these clues are interpreted) has become more prominent in the research field (Mendelsohn, 1995; Morley, 1991; Richards, 1983). Purdy (1997) has defined listening comprehension as "the active and dynamic process of attending, perceiving, interpreting, remembering, and responding to the expressed (verbal and nonverbal) needs, concerns, and information offered by other human beings" (p. 8). In the same vein, Rost (2002) has taken listening comprehension to be an inferential process requiring interaction between knowledge (both linguistic knowledge and world knowledge) and listeners while they create a mental representation of what they hear. In this approach, the listener takes a more active part in interpreting the verbal and/or nonverbal cues and giving feedback or response while listening. With the current approach that has been popular since the early 90s, there is also a focus on the social aspects of listening in addition to individual cognitive processes. Listeners not only construct meaning through psychological processes but also through a "contextual dimension of culture and society, where we construct meaning together and are all time influenced by the meaning that is already constructed" (Adelmann, 2012, p. 516). As this is so, several scholars have directed our attention to the development of listening as a social and cognitive skill (Lynch, 1998; Macaro,

Graham, & Vanderplank, 2007; Vandergrift, 2004). Since the 1990s, applying cognitive, metacognitive and social-affective strategies during listening and developing a metacognitive awareness of how to listen have been the core listening activities used in language teaching. Social-cognitive models of comprehension are regarded as crucial to learning. The process of listening is associated with cognitively active processes, social elements such as the speaker's intention to communicate, a listener's motivation to listen and contextual elements, all of which affect comprehension of the text being heard.

The Process of Listening

Listening is not merely the process of a unidirectional reception of audible symbols, but rather an active process since the listener integrates information from a variety of sources: phonological, syntactic, semantic, and discourse. Lynch (1998) proposes four dimensions in relation to the active processes of listening: speech recognition, memory in processing, discourse comprehension and access to process. The first dimension, speech recognition, is about comprehension of what listeners hear through their knowledge of prosodic elements of the language (i.e., rhythm, stress, and intonation of speech). Listeners segment the speech and recognize what they hear. Although the recognition of the speech element is essential to the process of listening comprehension, it does not necessarily in and of itself bring about comprehension. The second dimension, memory in processing, plays a crucial role in listening comprehension. The utterance needs to be retained in the listener's short-term memory for a while, so that the utterance can be processed for further semantic interpretation.

Short-term memory functions as “the interface between everything we know and everything we can see or do” (Cowan, 1993, p. 66). Baddeley (1986) regards it as the store where knowledge is encoded and retrieved from long-term memory. The characteristics of short-term memory are temporality (it temporarily activates neurons) and limited capacity (it holds a few items, according to Miller’s (1956) study, approximately seven items plus or minus two). The units or “chunks” might be different depending on the types of input (words, phrases or clauses) or existence of previous knowledge on that particular input. The units go through the process of semantic analysis and interpretation before they are selected for further retention in the long-term memory or simply deleted. The original wording of an utterance might get lost or forgotten once the meaning has been extracted (Jarvella, 1971). In short, short-term memory provides a space for language processing and determines whether the extracted meaning is to be retained in long-term memory (Call, 1985). The other system that controls and regulates performance in cognitive tasks is called working memory (WM). WM is based on short-term memory (STM), the biggest difference between them being a matter of dynamics. STM has mostly been considered as a passive domain while WM is dynamic and responsible for the temporary storage and exploitation of the information (Carroll 1994). WM has two storage domains: phonological loop handling phonological and verbal input and a visio-spatial sketchpad for processing for visual and spatial input. Central executive functions control these domains and other cognitive processes. Baddeley (2000) proposes three domains for the temporary storage and integration of information. These three domains are passive as they store input controlled by central executive functions. They are the visio-spatial sketchpad which might have elements

that goes into a visual semantic, the episodic buffer which might involve elements penetrating into episodic long term memory and the phonological loop which acts to put language learning into long-term storage. Thus, WM functions as "a bottle-neck" through which information passes to enter long-term memory for permanent retention (Juffs & Harrington, 2011, p. 139). Working memory is very important for language learning and processing. Individuals with larger WM capacity are better at learning vocabulary (both in L1 and L2), and have better L1 reading and listening comprehension (Atkins & Baddeley, 1998; Juffs & Harrington, 2011). Working memory (WM) is an important construct for language learning and processing. Individuals with larger WM capacity are better at learning vocabulary (both in L1 and L2) and have better L1 reading and listening comprehension. However, although WM capacity is well known to predict L1 comprehension ability, the relationship between WM and L1 and L2 fluency is unclear and debatable. WM also may explain how comprehension is constrained by the lack of available capacity (Just & Carpenter, 1992). The constraint of limited working memory is nonetheless rejected by some researchers, who assert that differences in comprehension are due to experience, not due to the capacity of the working memory system. Consistent with this claim, Andringa, Olsthoorn, van Beuningen, Schooner, and Hulstijn (2012) showed that working memory did not explain unique variance in listening comprehension among 121 native and 113 nonnative students of Dutch.

Discourse comprehension, Lynch's (1998) third dimension, is an extension beyond psycholinguistic concerns, which involves a series of cognitive processes (what, when and how processing of input occurs) and deals with why listeners listen. Listeners

bring their own background, world knowledge and experiences to the context of speech, and interpret the message of the text under real-time conditions. The fourth and final dimension is accessing the internal processes of listening, which are not readily observable or seen. Tracking of eye-movements can help to identify the cognitive processes in reading. However, in listening, one is often limited to self reporting by means of a questionnaire the specifics of which are influenced by the nature of the experiment. That is, the listener's ability to provide an accurate self-report might be limited, affecting the quality and quantity of the self-report. Nonetheless, it is agreed that a listener's self-report of his or her introspection of listening process, provides useful information about how listeners construct mental models and modify these models when receiving information (Ross, 1997).

In addition to the four aspects proposed by Lynch (1998), three other processes are acknowledged in terms of processing information while listening: bottom-up, top-down, and interactive processing through four sub-processes: sensory input, identification of sounds, breaking up of the sounds into linguistic units (morphemes, words) and assigning word meaning by relying on long term memory and comprehension. The direction of information flow either from the bottom-end of the system or from the top is what makes the difference between the first two processes. Bottom-up processing (the first type of model) is activated when sensory information enters into the system at the bottom-end and schemata are triggered through the hierarchical organization of the information—the phonological, morphological, lexical and syntactical knowledge in sequence. In other words, phonemic units are decoded and connected together to construct words, words are connected together to construct

phrases, phrases are connected together to construct utterances, and utterances are connected together to construct meaning out of text. However, comprehension is not solely dependent upon one's linguistic knowledge. It also requires nonlinguistic background knowledge. In top-down processing, the listener starts with his/her schemata and looks for information in the text that fits into these schemata. The listener actively constructs (or reconstructs) the original meaning of the speaker by using incoming information as clues. Interactive processing is the integration of bottom-up and top-down processing. Complex and simultaneous processing of background knowledge information, contextual information and linguistic information is interactive processing which enables comprehension. In interactive processing the integration of structural and nonstructural information is necessary for comprehension and the direction of information either from bottom or top is of no importance at all. The degree to which listeners employ these three processes depends on the purpose of listening, language proficiency of listeners, and the context. A listener who needs specific information or details in the text uses bottom-up processing to a greater extent than a listener who looks for the gist of a text.

Brown (2001) also presents eight steps that cover Lynch's (1998) dimensions in a series of steps while listening and constructing meaning. The eight steps are: raw speech, hearer's determination of speech type, hearer's inference, hearer's recall, hearer's literal meaning assignment, hearer's intended meaning assignment, hearer's determination, and hearer's message deletion.

Raw speech means that the hearer holds an image through stream of speech (phrases, clauses, cohesive markers, and intonation and stress patterns) in short-term

memory. The holding of the image is done naturally, that is why it is called “raw speech”. Hearer determination of speech type comes next. Ears select one of the sounds received. The sound selected is then interpreted by the hearer. As a follow-up step, inference of the message the speaker intends to convey occurs. The inference is done through the consideration of speech types, the context and content. The listener for example determines what speaker intends to declare: to wish, to complain, to report, and so forth. The hearer recalls background information relating it to the particular context and subject matter of the speech. The world knowledge and experiences activate cognitive associations for the interpretation of the message. Afterwards, the listener interprets the perceived message as it is uttered at the surface level and then assigns intended meaning to the utterance, going beneath the surface of the utterance. This step involves matching the perceived and intended meaning. For example, when a hearer receives a question “Can you open the door?”, the phrase is not asking whether one has the capacity to open the door but it is rather a request to open the door. After the hearer retrieves the intended meaning, he or she determines whether the information is to be retained in memory. The hearer will apparently retain a phrase in short-term memory when a quick oral response is necessary or in long-term memory if the context requires long processing information such as in academic lectures or stories. At the very last stage, if the hearer determines the information to be unnecessary the actual message may be deleted with only the important gist being retained.

Consequently, it can be stated that there is a series of hierarchical cognitive processes involved in listening, and that through these processes a listener actively constructs meaning out of text.

Current Perspectives of L2 Listening

In recent years, due to the tremendous varieties of aural and visual L2 text available via the internet, there has been increasing interest in L2 research studies related to L2 listening. L2 listening comprehension has become a focus of research and has been found to be important for the development of other skills (Dunkel, 1991; Lynch, 1998; Rost, 2002). Despite a number of studies that examine theoretical and pedagogical aspects of L2 listening (e.g., Anderson & Lynch, 1988; Dunkel, 1991; Flowerdew & Miller, 2005; Ross & Rost, 1991; Rubin, 1994; Vandergrift, 2007; Vandergrift & Goh, 2012), L2 listening has been long neglected compared to the other three language skills due to the fact that it is difficult to access and study the process of listening (Lynch, 1998; Rost, 1994) except by means of a recounting what has been understood out of the text. Additionally, listening is considered by second language learners to be the most difficult of the four language skills to learn (Graham, 2003) since it is the least explicit of the four skills (Vandergrift, 2004).

The approach to L2 listening has switched from "listening to learn" to "learning to listen" (Vandergrift, 2004, p. 3). That is, listening instruction and activities moved from repetitious listening to a more real-life listening approach, which is listening to communicate. This change has also brought reconsideration of L2 listening from two crucial perspectives regarding constructing and negotiating the meaning of text, namely cognitive and social/psychological perspectives (Vandergrift, 2007). The cognitive perspective includes bottom-up and top-down processing, both of which play a crucial role in the meaning construction. Through interactive use of bottom-up and top-down processes, the listener constructs an interpretation of the text and the message of the

speaker. However, success in L2 listening comprehension can be a challenge for nonnative speakers. It is claimed that nonnative speakers do not exploit linguistic cues as the natives do. Nonnative speakers are less likely to make use of syntactic information (Andringa et al., 2012) and rely on more top-down cues in listening than native speakers (Field, 2004). Another challenge for L2 listeners as nonnative speakers of a language is the automaticity of processing structural cues. Akker and Cutler (2003) investigated nonnative speakers' processing of prosodic information and found that they were slower than native speakers although both groups showed similar latencies. They claimed that nonnative listeners were less efficient in making connections between prosodic element and semantic elements of the utterances. Andringa et al. (2012) explain the challenges suggesting that knowledge extracted from measurement of vocabulary, grammar, and segmentation accuracy explains the largest variation in success in listening comprehension for nonnative speakers. For example, the beginning-level L2 listeners have limited structural knowledge of a language, very little of what they listen to is automatically processed as happens when listening in the L1. L2 listening comprehension may be negatively affected by the L2 listener's need to focus on details of structure and other limitations such as the speed of speech and working memory capacity. In such cases, the listener might rely heavily on contextual factors or any other relevant cues to guess what the intended message might be. It is generally stated that lower-proficiency L2 listeners attend to phonological or semantic cues, whereas higher-proficiency ones pay more attention to comprehension using semantic cues (Conrad, 1985).

Affirming this, O'Malley, Chamot, and Kupper (1989) report that skilled L2 listeners employ both top-down and bottom-up strategies to construct meaning, while less skilled listeners just determine the meanings of individual words. Jensen and Hansen (1995) point out that listeners with low-level of proficiency may not select appropriate schemata for global understanding whereas listeners with high-level of proficiency can "decode the input, interpret the semantic content and integrate the new information into his or her own knowledge system" (p. 102). Rubin (1994), however, claims that it is not clear what role grammar, vocabulary, culture and discourse play at different proficiency levels. Vandergrift (2007) states that skilled listeners use strategies such as comprehension, monitoring and questioning to divine and to confirm meaning, while less-skilled listeners resort to online translation. Vandergrift (2003) claims that the former uses a bottom-up approach exclusively and have tendency to segment what they hear, and might also have difficulties making connections between new information and their experiences, on the other hand, the latter group mostly makes use of the top-down approach, by inferring, self-questioning and making connections with the experiences and information previously acquired.

In line with Vandergrift (2003), Goh (2000) explains the difficulties L2 listeners face with reference to Anderson's (1983) model of perceptual processing, parsing and utilization. At the perceptual parsing stage, these include not recognizing words, neglecting what follows, not chunking the speech, missing the beginning of the text and general concentration problems. While parsing, L2 listeners might forget the details of the text and they fail to construct a mental representation of what they hear. They may also miss a part of speech, which affects understanding of incoming text. At the

utilization stage, listeners might understand the words but not the intended message, and they might be confused about the key ideas of the text. According to Goh (2000), the lower-proficiency listeners particularly suffer from problems at the processing and parsing stages. Especially when there is a rhythmical difference between L1 and L2, L2 learners may apply their L1 language specific segmentation procedures to a new but different language (Cutler, 2001). To resolve the problem, Harley (2000) stresses the importance of pause-bounded units rather than syntactic units for better comprehension in spite of L1 negative transfer of prosodic elements. In addition to L1 listening ability and L2 language proficiency, the other factors that are relevant to L2 listening are memory, pragmatic comprehension, and affective factors such as motivation and self-efficacy.

The role of phonological memory (the ability to recognize and remember phonological elements and their serial order) in listening ability and vocabulary learning is important in that the identification of sounds and phrases might not be as automatic as it is in L1 since the sound system of L1 might be different than that in L2. The ability to retain sounds and their order for a short time is one of the challenges in L2 listening. Comprehension and short term-retention of information (especially for new words and grammar structure) is less likely to occur when listeners fail to recognize the phonological elements and their order. It is thus claimed that phonological memory predicts the L2 aptitude of young learners including vocabulary and listening comprehension (O'Brien, Segalowitz, Freed, & Collentine, 2007). Similarly, polyglot adult learners have better phonological memory abilities and are better in L2 vocabulary learning than nonpolyglots (Papagno & Vallar, 1995).

Social/psychological perspectives of L2 include pragmatic comprehension, bidirectional listening and the affective dimension of listening (motivation, anxiety and use of metacognitive strategies). Pragmatic comprehension refers to use of relevant prior knowledge when interpreting a speaker's intent when communicating in a certain context. L2 listeners make use of their culturally bounded knowledge to make inferences and fixate speaker's intended meaning of the message when constructing meaning. Cook and Liddicoat (2002) report that higher-proficiency L2 learners automatically use both contextual knowledge and linguistic knowledge in the comprehension of speech acts (request strategies). Lacking automatic processing, the lower-proficiency learners make use of only bottom-up processing of linguistic information, which results in miscomprehension of the speech. At the phase of utilization (Anderson, 2005), listeners create conceptual events or scenarios from existing experiences or knowledge and associate them with the new emergent meaning in the text that the listeners have encountered. In this manner they interpret the contextualized meaning conveyed by the speaker (Dipper, Black, & Bryan, 2005). In bidirectional listening, the listener takes on a double role: speaker and listener. In some ways bidirectional listening might be easier than one-way listening as it takes place in context, however, it is also demanding in terms of cognitive processing as listeners do not only process the input but also confirm their interpretations and clarify meaning. Listeners also have freedom to make use of nonverbal or culturally-shaped cues that can help them to confirm meaning. Affective factors of listening are generally associated with feelings and emotions of listeners such as motivation, feeling of anxiety and self-efficacy. Motivation plays a crucial role in developing language learning skills in general. It is the primal effect that leads the

learner want to learn, that is to say, to seek opportunities for learning and to commit to making progress and overcoming obstacles (Rost, 2002). In L2 listening, listeners with high motivation perform better in listening comprehension than listeners with low motivation. This may be due to a lack of self-confidence and efficacy in the latter group. Low motivation learners are also found to have a passive attitude towards L2 learning and are reported to employ ineffective listening strategies. Closely related to motivation, it is stated that there is a negative correlation between language anxiety and listening comprehension scores (Elkhafaifi, 2005). Listening anxiety occurs when listeners feel that they are engaged in difficult or unfamiliar tasks (Scarcella & Oxford, 1992). Vogely (1998) lists sources of anxiety that impair listening comprehension under four categories 1) input such as the nature of speech, level of difficulty, lack of clarity, lack of visual support 2) inappropriate processing strategies, lack of time to process, 3) instructional factors such as lack of comprehension practice and distracting environment 4) personal factors such as fear of failure and low self-efficacy. When precautions are taken to reduce these sources of anxiety, listening comprehension becomes smoother and easier.

With the emergence of communicative language teaching methods and deeper understanding of the construct of comprehension, there has been a greater focus on fulfilling the learner's cognitive needs and social motivations. These new approaches support learner's development of L2 listening skills as their processes of aural input and interpretation of the intended meaning gradually become automatic. The strategic approach, that is learning to listen, helps to fulfill the learners' needs (Mendelsohn, 1998). Strategy instruction is emphasized so as to enhance learners' awareness of their

listening and learning processes and aid them in managing their comprehension and overall listening skill development.

Learning Strategies and L2 Listening Comprehension Strategies

Learning strategies are "specified actions taken by the learner to make learning easier, faster, more enjoyable, more self-directed, and more transferable to new situations" (Oxford, 1990, p. 8). They are not solely behavioral and observable. They can be considered mental (Ellis, 1994; O'Malley & Chamot, 1990). Regarding learning strategies in association with conscious and deliberate actions, O'Malley and Chamot (1990) describe them as "the special thoughts or behaviours that individuals use to help them comprehend, learn, or retain new information" (p. 1). O'Malley and Chamot (1990) build learning strategies on Anderson's (1983) model of perceptual processing. According to this model, learning a language involves the development of procedures that transform declarative knowledge into procedural knowledge. This transition takes place in three stages: The first stage is the cognitive stage, where the information is stored as facts and no association (activation of previous experience or knowledge) is necessary. The second stage is called the associative stage, where the learner tries to sort the new information and connects it with already-possessed knowledge through composition (collapsing several discrete productions into one), and procedural application (applying a general rule to particular instance). The third stage is the autonomous stage when the procedures become increasingly automated. Considering these three stages, O'Malley and Chamot (1990) propose a framework of strategies in three dimensions: cognitive, metacognitive and socio-affective. Cognitive strategies are related to processing information, that is, storing

input in working memory or long-term memory for later retrieval by the application of bottom-up or top-down processing. It involves direct manipulation or transformation of the learning materials (O'Malley & Chamot, 1990). For example in listening and reading learners make use of inference to guess the meaning of difficult words or ideas in their efforts to comprehend the text. Metacognitive strategies, in contrast, do not involve direct manipulation. They go beyond cognitive manipulation and transformation of new information. These processes involve thinking about the overall learning process in three key executive processes: planning for learning, monitoring of comprehension or production during learning, and self-evaluation of the learning process after the learning task is completed. These processes increase learners' consciousness of how information is processed and how they manage and regulate these cognitive processes. Metacognitive strategies can develop from prior experiences. An example of this is when a listener has a difficulty in recalling a word and then immediately remembers a similar difficulty she or he encountered and overcame in another listening context. The listener uses the prior experiences or knowledge and applies those lessons to a new context. Not all learning experiences will trigger a metacognitive reference to prior situations. Socio-affective strategies involve collaboration and interaction with others in learning, and establishing empathy, compassion, and motivation between group members. These strategies help reduce anxiety, increase self-confidence and personal motivation in accomplishing the learning task resulting in improved comprehension. The influence of social and affective strategies are regarded the most immediate of all (O'Malley & Chamot, 1990) and they are shown to significantly boost learning (Dansereau, 1983). Ellis (1994) lists these general characteristics of learning strategies as follows: 1) Strategies refer to both general

approaches and specified actions or techniques used to learn an L2. 2) Strategies are problem-oriented. 3) Learners are generally aware of the strategies they use. 4) Strategies involve both linguistic and nonlinguistic behavior. 5) Linguistic strategies can be performed in L1 and L2. 6) Some strategies are behavioral while others are mental. 7) In general, strategies contribute indirectly to learning; however, some strategies may also contribute directly. 8) Strategy use varies considerably as a result of both the kind of task the learner is engaged in and individual learner preferences (Ellis, 1994, pp. 532-533). These characteristics need to be taken into account when describing language learning strategies.

Another point to consider is that the use of certain strategies and explicit teaching of the strategies should coexist for the efficiency of the learning outcome since language learning needs vary widely among individuals (Chamot, 2004). For example, in a language class where learners aim to learn a language for basic communication skills to interact with the other speakers of the language, compensatory or affective strategies can work better than some other strategies. On the other hand, if a language learner learns a language in an academic context, cognitive learning strategies may be a more efficient choice.

Language learning strategies are differentiated by the framework and characteristics of learning strategies. Initially, in the early seventies, the language learning strategies of successful (good) language learners (Naiman, Frohlich, Stern, & Todesco, 1978; Rubin, 1975) were listed as a model to encourage other learners to employ similar strategies. Later, the description of language learning strategies were expanded, now there are a number of classifications with various specific dimensions

such as direct or in direct strategies, task, realization of language as system, management of the system and monitoring (Naiman et al., 1978; Oxford, 1990). One of the most common strategy categorizations was developed by Oxford (1990) and it involves two dimensions: direct and indirect strategies. Direct strategies include three subcategories: memory strategies (creating mental linkages, applying images and sounds, reviewing well, employing action), cognitive strategies (practicing, receiving and sending messages, analyzing and reasoning and creating structure for input and output), compensation strategies (guessing intelligently and overcoming limitations in speaking and writing). Indirect strategies support language learning without directly involving the target language and they can be classified into three subcategories: metacognitive strategies (centering one's learning, arranging and planning one's learning and evaluating one's learning), affective strategies (lowering one's anxiety, encouraging oneself, taking one's emotional temperature) and social strategies (asking questions, cooperating with others and empathizing with others). These strategies, if explicitly taught, improve language learning. In the O'Malley, Chamot, Stewner-Manzanares, Kupper, and Russo's (1985) study, ESL students who received learning strategy training on vocabulary, listening, and speaking tasks scored higher on the integrative language tasks. The result implies that strategy training can be effective for integrative language learning and that strategic processing appears to be fundamental to learning.

L2 listening comprehension strategies are the application of general learning strategies to specific language skill learning. As L2 listening is considered to be an active process through which the listener constructs meaning out of what they select and

interpret in terms of what they already know a listener's active involvement in their own listening and controlling the process of listening can be enhanced by use of learning strategies. Vandergrift (1999) claims that effective strategy development is crucial to L2 listening comprehension. Because such training allows the learners to consciously monitor and evaluate their own listening comprehension and responses. Thompson and Rubin (1996) confirm the improvement of L2 listening comprehension through systematic instruction in the use of strategies. It is recommended that listening comprehension strategies can and should be taught by the instructor explicitly to help listeners improve listening comprehension (Chamot, 1995; Goh, 1997; Mendelsohn, 1994). Mendelsohn claims that language instructors should encourage learners to employ L1 listening comprehension strategies when they listen to a text in L2 (Mendelsohn, 1994). By doing so, these strategies are brought to a conscious level, and this enables learners to apply them in a L2 context. The conscious use of strategies increases the learners' self-confidence and their ability to deal with more difficult listening passages, and reduces their anxiety while they listen.

Studies on listening comprehension strategies highlight the different strategies employed by listeners with different levels of L2 proficiency. A significant relationship between listening ability and listening skills has been found (Feyten, 1991; Vandergrift, 1997, 1998). Vandergrift (1997, 1998) claims that the novice listeners have a difficulty in applying metacognitive strategies such as monitoring since they focus mainly on processing the text structurally, whereas the intermediate-level listeners use metacognitive strategies twice as much as the novices do. The depth of processing and the strength of prediction are major differences between these two listener groups.

Based on the taxonomy by O'Malley and Chamot (1990), Vandergrift (2003) proposes taxonomy of listening comprehension strategies (see Figure 3).

Metacognitive Strategies		**Cognitive Strategies**	
1 Planning	Developing an awareness of what needs to be done to accomplish a listening task, developing an appropriate action plan and/or appropriate contingency plans to overcome difficulties that may interfere with successful completion of the task.	*1 Inferencing*	Using information within the text or conversational context to guess the meanings of unfamiliar language items associated with a listening task, or to fill in missing information.
1a) Advance organization	Clarifying the objectives of an anticipated listening task and/or proposing strategies for handling it.	1a) Linguistic inferencing	Using known words in an utterance to guess the meaning of unknown words.
1b) Directed attention	Deciding in advance to attend in general to the listening task and to ignore irrelevant distracters; maintaining attention while listening.	1b) Voice inferencing	Using tone of voice and/or paralinguistics to guess the meaning of unknown words in an utterance.
1c) Selective attention	Deciding to attend to specific aspects of language input or situational details that assist in understanding and/or task completion.	1c) Extralinguistic inferencing	Using background sounds and relationships between speakers in an oral text, material in the response sheet, or concrete situational referents to guess the meaning of unknown words.
1d) Self-management	Understanding the conditions that help one successfully accomplish listening tasks and arranging for the presence of those conditions.	1d) Between-parts inferencing	Using information beyond the local sentential level to guess at meaning.
2 Monitoring	Checking, verifying, or correcting one's comprehension or performance in the course of a listening task	*2 Elaboration*	Using prior knowledge from outside the text or conversational context and relating it to knowledge gained from the text or conversation in order to fill in missing information.
2a) Comprehen-sion monitoring	Checking, verifying, or correcting one's understanding at the local level.	2a) Personal elaboration	Referring to prior experience personally.
2b) Double-check monitoring	Checking, verifying, or correcting one's understanding across the task or during the second time through the oral text.	2b) World elaboration	Using knowledge gained from experience in the world.
		2c) Academic elaboration	Using knowledge gained in academic situations.
		2d) Questioning elaboration	Using a combination of questions and world knowledge to brainstorm logical possibilities.
		2e) Creative elaboration	Making up a storyline or adopting a clever perspective.
3 Evaluation	Checking the outcomes of one's listening comprehension against an internal measure of completeness and accuracy.	*3 Imagery*	Using mental or actual pictures or visuals to represent information.
4 Problem identification	Explicitly identifying the central point needing resolution in a task or identifying an aspect of the task that hinders its successful completion.	*4 Summarization*	Making a mental or written summary of language and information presented in a listening task.
		5 Translation	Rendering ideas from one language in another in a relatively verbatim manner.
		6 Transfer	Using knowledge of one language (e.g., cognates) to facilitate listening in another.
		7 Repetition	Repeating a chunk of language (a word or phrase) in the course of performing a listening task.

Figure 3. Taxonomy of metacognitive and cognitive listening comprehension strategies.

Vandergrift (2003) suggests that the use of metacognitive strategies (comprehension monitoring, problem identification, and selective attention) is a significant factor in distinguishing the successful from the less successful listener. Whereas novice listeners use cognitive strategies, such as translation, transfer, and repetition, intermediate listeners employ metacognitive strategies such as comprehension monitoring, selective attention, and problem identification. He also points out that more skilled listeners appear to be more flexible in strategy use, combining strategies in an effective manner. In addition, strategies associated with three phases of the listening process (perceptual processing, parsing, utilization) can be identified in think-aloud protocols of skilled listeners.

Through a thorough analysis of a number of extracts from listening diaries, Goh (2002) lists the following cognitive processes: the stop and search for meaning of the words, thinking of the words and spelling them out mentally, translating the words in L1, reconstructing meaning from words heard and visualizing all the words heard. Goh's (2002) study reveals the following problems encountered during listening: taking notes or reading any other interfering elements like subtitles, being slow to recall the meaning of words, not being able to recognize the sounds of words, understanding the individual words but missing the overall meaning, missing the rest of the text due to the factors such as a lapse in concentration or interference with other elements in the setting and not being able to separate streams of speech. Thus, Goh (2002) suggests the following factors that affect listening comprehension: phonological modification/prosodic features of L2, types of input, length and structure of the text, unfamiliar vocabulary, existing knowledge and topic familiarity, interest in the text topic, physical factors and emotional

context. Strategies that assist comprehension and recall offered by Goh (2002) include the use of visual clues (pictures, slides, body language), active knowledge of context, ignoring unfamiliar words, taking notes, recognizing discourse markers and tones, guessing meanings, paying attention to repetitions, visualizing the setting, using existing knowledge and asking for repetition.

Vandergrift (2010) emphasizes developing listening tasks that enable learners employ prediction, monitoring, evaluation and problem solution. This can boost metacognitive awareness, which is regarded as "critical to the development of self-regulated listening" (p. 473). He suggests that instruction in the metacognitive processes of listening enable beginner-level learners to appreciate the process of learning providing them with knowledge and tools so that they better learn how to listen. This approach makes text accessible and more authentic at the beginning of the listening process, thus making the whole process more relevant. Metacognitive awareness is also claimed to be significant for L2 listening comprehension success. Vandergrift, Goh, Mareschal, and Tafaghodtari (2006) note, based on the self-reports of 115 L2 learners of English and 226 L2 learners of French, that metacognitive awareness and strategic competence account for 13% of the variability in listening comprehension success.

In addition to highlighting the importance of metacognive awareness, Vandergrift (2007) mentions that the tools for eliciting and developing awareness of the listening process such as questionnaires, listening diaries and discussions are "reflection activities" of the listeners on their meaning construction process (p. 197). In a multimedia environment, it is possible to track listeners' behaviors without interrupting the listening processes. With online tracking of user behavior collected through mouse

clicks or taps on the screen, the interaction between the listener and the text in terms of input enhancement resources used, time spent on task, or audio control tools used can be easily observed. Such data can provide valuable information about the listening strategies utilized by the listener. Through tracking listener behavior, Roussel (2011) performed an analysis of students' listening behaviors and their time spent on task. She identified four different patterns of self-regulation. These patterns mainly fell into two major categories: interrupted and uninterrupted representing analytical and global listening respectively. These two patterns have various subsets: (1) Students listen to the text globally in the first listening and then start analytical listening in the second, meaning that after an overall comprehension, they focus on the textual elements to confirm, reject or clarify their comprehension, which reveals their planning and monitoring strategies. (2) Students listen to the text analytically followed by one or more globally listening. This strategy often resulted in poor comprehension. (3) Students listen to the text once or several times globally without any regulation. This occurred with bilingual or high proficiency learners. (4) Students listen to the text only once utilizing analytical listening but without any global listening. This strategy was used by listeners with poor initial level of English. They employed actions and buttons in a more disorganized way. This disorder usually hinders high-level processing such as planning and monitoring.

Roussel, Rieussec, and Tricot (2006) investigated performance under three listening conditions: listening once, listening twice, and self-regulated listening. They observed that more idea units were remembered under the self-regulation condition. The difference in performance in the three listening conditions was less noticeable with high

proficiency learners. The advanced group's frequent use of the action buttons such as stop and replay in self-regulated listening suggests that advanced-level learners knew what required verification or close attention as regards the text. Such patterns of movement by the listeners give insights into how metacognitive strategies can be implemented to boost comprehension, overcome listening difficulties, or meet the needs of listeners to ensure comprehension.

These studies illustrate how tracking data may provide insights regarding the listening process. Monitoring self-regulated listening strategies (global and analytical) gives clues as to how listeners fail and succeed when constructing meaning. In addition, online tracking of physical movements such as mouse clicks leads to a better understanding of how factors such as language proficiency or the linguistic features of text affect the listening process and performance (Roussel, 2011, p. 113).

Incidental Vocabulary Learning

Learner's acquisition of new words through incidental learning has been of interest to language researchers. A number of research studies have been done which focus specifically on reading and incidental vocabulary learning gains (Huckin & Coady, 1999; Hulstijn, 1992; Laufer, 2005; Nation, 2001; Read, 2004), and the acquisition of vocabulary knowledge as regards to form and meaning (van Zeeland & Schmitt, 2013).

The term *incidental vocabulary learning* originates from the field of psychology with a reference to implicit vs. explicit learning. Implicit and explicit learning are distinguished by the absence or presence of conscious awareness of operations. In vocabulary learning, these distinctions correspond to the awareness and intentionality of

incidental vs. intentional vocabulary learning. Incidental vocabulary learning occurs in the mind's unconscious operations and is often contrasted with intentional learning—a more overt conscious operation in learning. Ellis (1999) highlights the difference between incidental and intentional vocabulary learning by describing two types of attention: focal and peripheral attention. He claims that "intentional learning requires *focal* attention to be placed deliberately on the linguistic codes (i.e., on form or form-meaning connections)", whereas "incidental learning requires attention to be placed on meaning (i.e., message content) but allows *peripheral* attention to be directed at form" (pp. 45-46). Schmidt (1994) also highlights that irrespective of the types of vocabulary learning (incidental and intentional), any learning requires a minimal baseline degree of attention. What makes these two types of vocabulary learning distinct from each other is the degree of deliberateness with which attention is directed to learning (Schmidt, 1994, p. 198). In the same vein, Hulstijn (1998) remarks that incidental vocabulary learning being a by-product of any learning activity does not exclude the possibility of attention directed toward word form versus meaning at all, rather a degree of attention to word form must be necessary for implicit vocabulary learning. A minimal degree of attention is important for retention. The position that no learning occurs without attention stems from the fields of cognitive science and psychology and is associated with models of memory. It is discussed that unattended stimuli persist in short-term memory for only a very short time and attention to stimuli leads to encoding in long-term memory. In second language acquisition, attention is likewise considered to be crucial and necessary for deeper mental processing and language retention. Highlighting the degree of attention in vocabulary learning as an important element in the word recall and

retention, Ma (2013) claims that single exposure without any attention to the word does not suffice to keep it available for retrieval, but on the other hand, even one single exposure with sufficient focal attention to the target words might promote vocabulary intake.

Rieder (2003) states that there is a problem with the operational definition of incidental vocabulary learning in that regarding it as a byproduct of another activity does not mean that incidental learning implies a passive role of the learner in learning (p. 26). She further observes that implicit and incidental second language learning are even equated with each other in L2 pedagogy. The distinctions between them are still vague. For example, Hulstijn (1998) defines implicit learning as learning "without teaching" and "without conscious inductions" (p. 49), while acknowledging that incidental vocabulary learning requires the learner's attention as explained above. The degree of consciousness required for language retention remains vague. Incidental vocabulary learning is also referred to as learning without intention. This definition does not mesh exactly with the notion that implicit learning is learning without conscious awareness. Both Hulstijn (2001) and Rieder (2003) agree that incidental learning has a complex nature, whereas intentional learning is fairly straight forward as it is solely explicit. For example, a reader can read a text and infer the meaning of a word from context without any conscious intention to learn it. To provide a better conceptualization of incidental vocabulary learning, Rieder (2003) offers a unified concept of implicit and explicit learning in the process of incidental vocabulary learning, claiming that incidental vocabulary learning includes both learning without the learner's awareness (implicit learning processes) and learning without intention but with a minimal degree of

conscious awareness and hypothesis formation (explicit learning processes). Ellis (1994) gives an account of what the implicit and explicit learning processes could be in incidental vocabulary acquisition. He claims that acquisition of a word's form, collocations and grammatical class information involve implicit processes, whereas acquiring a word's semantic features and mapping word form to meaning result from explicit learning processes. However, he claims that although implicit and explicit learning mechanisms exist in incidental vocabulary learning there is a disassociation of the formal (implicit) and semantic (explicit) aspects of vocabulary learning.

Apart from the ambiguities of terms dealt with in dichotomy, another issue in comparison of incidental and intentional vocabulary learning is the nature of vocabulary gains in both orientations. It is stated that learning new words incidentally might not be as beneficial as intentional vocabulary learning (Bruton, López, & Mesa, 2011). Hulstijn (1992) compares the effect of incidental and intentional orientations on vocabulary retention and finds that both orientations have facilitated L2 vocabulary learning, however intentional vocabulary learning resulted in greater vocabulary performance when compared with incidental vocabulary learning.

Factors such as word knowledge as well as frequency of occurrence have been presented in association with incidental vocabulary learning. The word knowledge of average adults includes semantic features (literal, pragmatic and stylistic meaning and associations) use (grammatical functions, collocations, constraints on use such as register, frequency and so forth) and formal features (word class, morpho-phonological features, phonetic and orthographic form) (Hulstijn, 2001; Nation, 2001). A number of exposures are necessary for gaining vocabulary knowledge. A single exposure does not

suffice to increase vocabulary gains. Rott (1999) has investigated the effect of frequency between 2, 4, and 6 exposures during reading and concluded that six exposure frequencies produced significantly more vocabulary retention than the other two exposure frequencies. The minimum number of occurrences needed for long-term vocabulary retention varies between at least 8 and 10 in existing studies. Webb (2007), and Pigada and Schmitt (2006) state more than 10 exposures in context can accelerate vocabulary learning. Waring and Takaki (2003) claim that there must be at least 8 repetitions to have a %50 chance of recognizing the word form or its meaning after a certain time (approx. 3 months later). Task type such as reading a text with occasional focus on form or with focus on form (Laufer & Rozovski-Roitblat, 2011) and actual language proficiency can also affect the number of minimum exposures necessary to acquire new words. Beginner learners may need more exposures than advanced learners and repeated exposure seems to be three to four times more important for beginners than it is for more advanced students (Zahar, Cobb, & Spada, 2001). In addition to language proficiency, other variables to determine the threshold for the effective number of the exposures have been identified such as word's salience in a text (Brown, 2000), the definition of successful acquisition (Henriksen, 1999) the word's morphology, the learner's motivation and so forth.

As for actual vocabulary gain, vocabulary intake is found to be relatively slow meaning that it is not incremental just from exposure or occurrence (Coady, 1993; Laufer, 2005; Nation, 2001; Read, 2004). Incidental vocabulary learning occurs more through extensive reading where an input-rich, contextualized environment is provided and learners are encouraged to choose what they want to read from reading options that

match the level at which they can comprehend the text. Moreover, extensive reading tasks can increase a learner's fluency, as the reader learns to rely upon contextual cues instead of looking up each individual unknown word while reading. Huckin and Coady (1999) add another advantage of incidental vocabulary learning and state that it is pedagogically efficient as reading and vocabulary learning occurs concurrently.

Researchers have also been interested in the investigation of how incidental acquisition occurs and what factors affect incidental vocabulary learning. They investigate the kinds of processing that go into it and explore the effects by employing one of the two methods (Laufer & Hulstijn, 2001): The first method allows learners to be involved in a diversionary task without any specific instructions as to the actual learning task, they are assigned relevant tasks which require exposure to the material; yet, a later retention test is not expected. To illustrate, learners are given a list of words with a task to identify and correct spelling mistakes if any. Later for the testing, they are asked to recall the words in the list. The other method allows learners experience with the learning material but not the specific information to be tested. For example, learners are provided a text and told that they will be asked to recall the content of the text; however, they are not informed that they will be tested on their retention of the unknown words in the text. In both methods, the common point is that learners are not informed about the following retention test. Performance on the unexpected retention test is taken to be an indicator of incidental vocabulary learning. What causes better subsequent retention seems to be of interest in regards to incidental learning. Hulstijn and Laufer (2001) note that words learned incidentally are retained in long-term memory and can be exploited in different situations, and also affirm that incidental vocabulary learning

involves deeper cognitive processing leading to better retention in the long-term memory, which is crucial for the integration of a word into one's lexicon. With regards to long-term recall, "successful learners not only can analyze and rehearse the new words and their meaning, but also can elaborate the word-meaning complex and establish it within a suitable network of meaning" (Lawson & Hogben, 1996, p. 104). That observation is basis for the *Involvement Load Hypothesis* (Laufer and Hulstijn, 2001) which postulates that information that is processed at a deep level remains in memory longer. Thus, it is argued that focus on meaning is important for language learning (Ellis, 1994). Be it focus on form or meaning, some degree of conscious attention is necessary in incidental vocabulary learning (Schmidt, 1993). When the meaning of words is added, the information is processed at a deeper level making it even more likely to be remembered with its features and applied in the long run. An example of this is when a learner sees or hears a word for the first time; the word is retained with a variety of features (meaning, associations, and usage) not solely with the strict definition. In relation to the Involvement Load Hypothesis, Laufer and Hulstijn (2001) present the notion of involvement in three components:

(i) Need as a motivational construct to identify a new word's meaning for completing a given task. This drive is moderate when it comes externally, but strong when it is intrinsic. For example moderate when teacher asks learners to look up for the usage of a word. On the other hand, it is strong if learner is self-motivated and looks up the meaning when he or she needs it by him- or herself.

(ii) Search as a cognitive construct to find out the meaning of the word. It might be absent when the information is provided and there is no need to search for meaning, such as when the unknown, new word is glossed or very present when the learner has to rely upon contextual cues and research to confirm meaning and usage.

(iii) Evaluation also as a cognitive construct to compare the new words with the other words or judge if the meaning of the word applies to the verbal or nonverbal context. This is an active decision making process during a given task.

To transform these terms into measurable task-specific components, Laufer and Hulstijn (2001) have used an involvement load index, which uses plus (+) and minus (−) signs as representative of the presence or absence of involvement load components (i.e., need, search, and evaluation). The presence of an involvement load component equals 1. Moderate and strong version of the involvement factor influence is indicated by 1(+) and 2(++) respectively. Involvement absence equals 0. In this manner, the Involvement Load Hypothesis demonstrates that the degree of retention is both measurable and directly related to the complexity of cognitive processing involved with the learning. Of course, not all tasks require learners go through these three components to glean the meaning of unknown words, but the tasks involving these components have a high degree of involvement, making it more likely that learners will retain the new vocabulary. Working on an empirical study of the effect of various tasks on incidental vocabulary learning, Laufer and Hulstijn (2001) affirm that tasks which necessitate a deeper level of processing and task-induced involvement have a superior effect on the

retention of previously unknown words. In another study by Hulstijn and Laufer (2001), they examined the effect of output on L2 incidental Learners who were asked to do tasks such as fill-in-the blank or sentence writing and composition and found that they did better than those learners who read the text with the target words (marginal gloss). Among the involved tasks, learners in the composition group outperformed the other two groups. This supports the positive correlation: the higher involvement load, the better the retention. Kim (2008) has investigated the effect of the three tasks suggested by Hulstijn and Laufer (2001) for vocabulary learning. He also noted that a higher degree of involvement promoted retention of target words. In line with the findings of these studies (Hulstijn & Laufer, 2001; Kim, 2008), Keating (2008) also supports this correlational relationship between involvement and retention. He examined the effect of three tasks (reading only, fill-in-the-blank, and sentence writing) on vocabulary learning and found out that the participant involved in sentence writing (a task requiring higher involvement) outperformed the other two groups. Investigating the effects of three tasks (no dictionary use, initial-dictionary use at the beginning of reading, self-directed dictionary use with example sentence writing on a notebook), on incidental vocabulary learning through reading, Cho and Krashen (1994) also affirm that tasks requiring a greater level of processing of the unknown words yield better vocabulary learning, in the aforementioned study, self-directed dictionary use resulted in better vocabulary learning than no dictionary use through reading.

As can be seen from the volume of the research done on incidental vocabulary learning so far, there has been much attention to reading and incidental vocabulary learning and very little attention on L2 listening and its effect on incidental vocabulary

learning. The comparison of reading based tasks has dominated the field and the relatively few existing studies on L2 listening which compare the vocabulary gains of listening and reading conclude that smaller vocabulary gains occur in L2 listening than in L2 reading (Brown, Waring, & Donkaewbua, 2008; Vidal, 2011). In Brown et al. (2008) study, the different effects of three modes (reading, reading-while-listening, and only listening to stories) on vocabulary acquisition are investigated and they have used two instruments as a posttest after the treatment (multiple choice and translation from L2 to L1) at three different intervals: immediate post-test, one week delayed post-test, and three months delayed post-test. They observed that higher scores in reading-while-listening mode were attained than in the other two conditions, and that the listening-only was the least effective mode in vocabulary retention. Vidal (2011) has compared vocabulary gains from listening and reading and examined the effects of occurrence and predictability of words on learning and found that with respect to vocabulary knowledge gains, the gains from reading were remarkably higher than those from listening; yet, the gains from listening were retained better. Van Zeeland and Schmitt (2013) explain the reasons for this in relation to the continuous nature of L2 listening, which necessitates processing auditory input fast in a relatively shorter time than that required for reading.

Last but not least, complexity of assessment might be problematic, and some vocabulary knowledge may not be assessed and thus not gained. Waring and Nation (2004) also mention assessment type as a general impediment to assessing level of word knowledge. Vocabulary gains are assessed by the form-meaning type in multiple-choice or translation test forms, undermining the importance of other types of word knowledge (i.e. formal vs. informal, common vs. uncommon usage of the words is not provided or

assessed in such tests). Waring and Takaki (2003) investigate the effect of test type on vocabulary gains and find that the type of tests can affect the amount of words determined to be learned. The recognition test yielded the highest score, the multiple choice test was the next and translation test was the lowest. Selecting appropriate meaning from possible options in a multiple-choice test, the retention of form and meaning of word is guided and relatively easier than translation. The translation test is the most demanding task requiring recall of word meaning without any assistance and in this task the effect of incidental vocabulary gains is regarded as cumulative where learners construct the knowledge of word through occurrence in a period of time.

In addition to the comparative studies of incidental vocabulary learning from reading and listening, studies that focus on listening alone and incidental vocabulary learning have appeared in the field, though they are few. Van Zeeland and Schmitt (2013) have investigated L2 learner's acquisition of vocabulary knowledge dimensions (form recognition, grammar recognition and meaning recall) by L2 listening. Participants in the study were asked to listen to four passages of different genres. After listening to the passage, the participants were instructed to answer general questions and then more detailed questions about the content. After this comprehension test, they were asked to complete three vocabulary tests immediately (form recognition, grammatical knowledge, and meaning recall successively). These tests were again administered a week later. The results indicate that L2 listening led to incidental vocabulary learning, most of which was related to the acquisition of word form and to a lesser degree word meaning. That is, the participants showed differential levels of knowledge of the three

dimensions with form > grammar > meaning immediately after listening, and two weeks later this was form = grammar > meaning.

This may be due to the fact that more than ten repetitions are necessary to recall the word's meaning. The study by van Zeeland and Schmitt (2013) highlights the necessity of a form-meaning test format to evaluate knowledge gains obtained through L2 listening. A study by Smidt and Hegelheimer (2004) on L2 listening and incidental vocabulary learning included other variables such as strategy use and CALL listening activity. The researchers have examined incidental vocabulary learning through listening to authentic web-embedded video. The participants were asked to complete a pretest, posttests and delayed vocabulary tests as well as engage in a learning activity and complete a questionnaire. The result affirms that incidental vocabulary learning through L2 listening does occur and that strategy use during listening is based on proficiency level: advanced learners show both metacognitive and cognitive learning and intermediate and lower ones made use of cognitive strategies while listening to CALL video. As language learning skills have been guided by the technological development over the last decade, L2 listening skills have been also investigated in multimedia environments where authentic contextually rich-input are provided. Technology has enabled the use of different language supporting techniques such as captions (Markham, 1999; Sydorenko, 2010; Winke, Gass, & Sydorenko, 2010), and annotations (Jones, 2003, 2004) which have been used to support learners with the aim of better L2 listening comprehension and retention of L2 vocabulary. Through such multimedia supported listening, incidental vocabulary learning can be augmented and the input enhancements (i.e., captions, annotations) may positively affect the overall vocabulary gains. This is

due to fact that the learner's attention on input is enhanced and target words are presented with visuals which aid the recognition of written word forms and word meaning (Sydorenko, 2010). The following chapter will present further information about a type of input-enhancement, namely glosses, and their effects on L2 listening and incidental vocabulary learning.

CHAPTER 4

GLOSS USE

This chapter will provide a review of the studies on gloss use in L2 reading along with L2 listening since the body of research on the former is larger. As discussed in the previous chapter, knowing a word or comprehending a text depends on various factors. And learning a word from context through extensive reading is not always optimal since insufficient attention may be paid to knowing the exact meaning of unknown words (Shu, Anderson, & Zhang, 1995). As a consequence learners can fail to learn new words properly or simply ignore them especially when they are reading for the general gist of the text. This may lead to failure in vocabulary learning and making connections between propositional units in the text and often in failure to comprehend the text. A supportive and preventive technique to cope with this failure is input modification (Hong, 2010) through glossing or annotating a text.[1] In this chapter, the existing studies related to glosses are organized as follows: definition and advantages of glosses, previous studies on gloss use in L2 text comprehension and incidental vocabulary learning (both paper and multimedia glosses), and previous studies on gloss use in L2 listening. The chapter concludes with a connection of the existing multimedia gloss use studies in L2 listening and other MALL studies on L2 listening in particular.

[1] The terms "annotation" and "gloss" are used interchangeably in this review.

Definition and Advantages of Glosses

Gloss is a kind of modified input that facilitates text comprehension processes. They can provide dictionary-type information such as the meaning/s of a word in the form of a definition, its synonym or antonym, its L1 equivalent, phonetic pronunciation, and example sentences (Lenders, 2008). Blohm (1982) defined glosses as "a type of reader-activated superimposed intratext notation that replaces abstractly-composed text content with concrete referents to promote readers' cognition" (p. 24). Roby (1999) provided another definition referring to glosses as "many kinds of attempts to supply what is perceived to be deficient in a reader's procedural or declarative knowledge" (p. 96). With the advancement of technology, it is possible to provide this supplementary information in different modalities (textual, visual or auditory). Verbal or pictorial glosses in a text can be presented with hyperlinks at different locations on the screen (at the bottom, in the margin or in pop-up window).

Glosses mainly function as a supportive aid for retention. Nagata (1999) lists four advantages of marginal glosses, illustrating their effect on improving retention: (1) They are easy to use; (2) They direct readers' attention on the target words because the input is enhanced and modified, thus salient; (3) Words are connected to meaning, so meaning-form connection is provided; (4) Learners process words by referring to target words and glosses, which yields better retention of the words. In line with Nagata, Ko (2005) notes that guessing meaning of the words in context might be difficult or unfeasible for a learner due to inefficient reading strategies or low language proficiency. Glosses can help readers learn new words in a text accurately. Additionally, they "assist the learner as a mediator between the text and the learner" (Ko, 2005, p. 125), providing

smoothness in reading and the connection of meaning and form in context (Rott & Williams, 2003). With glosses, readers need not interrupt their reading to look up unknown words in a dictionary and thereby they do not get distracted in the process of constructing a mental representation of the text (Lomicka, 1998; Schmitt, 2008). Not least, readers have the liberty of looking up the words they think they do not know; glosses encourage autonomy, thus providing a leaner-oriented space for reading comprehension (Shahrokni, 2009).

Ko (2012) discusses that glosses make the language form salient so that the learner can notice a form in the text in order to process and convert it into intake, which boosts comprehension and retention. This is supported by Nagata's (1999) study in which he claims that gloss salience can catch the learners' attention, supporting the learner's conscious learning and input-enhancement for comprehension. In a study exploring how form-meaning connections are built and strengthened through single and multiple-choice glosses, Rott (2005) mentions the benefit of glosses for access to word meaning. The target word is triggered through bold face type within a text. Readers first notice the orthographic representation of the target word (Schmidt, 2001) and selectively attend (Gass & Selinker, 2001) to its semantic meaning provided in marginal glosses, which in turn enhances word retention (Al-Seghayer, 2001; Bensalem & Aust, 2007). According to Schmitt's (2000) noticing hypothesis, glosses help learners to acquire the target forms more easily by makin the words salient and thus more noticeable. When utilizing annotations, learners selectively attend to a particular lexical form and integrate the target form with its meaning into his or her already existing knowledge of target language.

In addition to a noticing effect, Shahrokni (2009) emphasized immediate access to information needed for clarification, learner-text interaction, and hands-on experience as additional benefits of glosses. Through multimedia glosses, learners take a more active role in seeking knowledge and experience the whole process of learning and meaning-construction instead of acquiring the language passively. Erçetin (2003) and Türk and Erçetin (2014) point out the potential of CALL glosses to give control to the learner over the learning process. Because the multimedia glosses give learners freedom to choose which items require attention and partake in the tasks interactively they more actively participate in the learning process.

Taxonomy of glosses is proposed by Roby (1999). He acknowledges that (1) Glosses are generally modified or created, thus authorship belongs to either learners or professionals (i.e., instructors or material developer), (2) They can be priming (preceding a text) or prompting (being consulted while reading a text), (3) They include (a) procedural functions, that is to say, metacognitive, highlighting and clarifying the meaning, and (b) declarative functions, namely encyclopedic and linguistic that can be further divided into two subsets: lexical (including significance and value) and syntactical. (4) Their focus can be textual or extra-textual. (5) They can be in L1, L2 or/and L3. (6) They can involve information in textual, pictorial (image, icon, video with or without sound) and auditory-only forms.

Acknowledging glosses as a way of dealing with incidental vocabulary learning and text compression, researchers in the field seek to empirically investigate the effects of glosses on L2 learning, particularly text comprehension and incidental vocabulary learning.

Previous Studies on Gloss Use in L2 Text Comprehension and Incidental Vocabulary Learning

The existing studies on gloss use in L2 text comprehension and incidental vocabulary learning can be categorized as nonmultimedia and multimedia glosses depending on the type of glosses the researchers employed. Early research simply employed paper-based glosses. With the integration of technology into instructional materials, multimedia annotations have been incorporated into text utilizing multiple forms of media.

Paper-based Glosses

Several studies on input enhancement investigated the effect of printed glosses demonstrated that that glosses can facilitate reading comprehension (e.g., Davis, 1989; Jacobs, Dufon, & Fong, 1994) The type of gloss commonly studied in earlier investigations was marginal glossing, that is, additional notes or information related to the text in the margin of the paper the text was printed on. The use of marginal gloss was found to not only enhance text comprehension (Davis, 1989) but also incidental vocabulary learning (Hulstijn, 1992; Watanabe, 1992 as cited in Hulstijn, Hollander, & Greidanus, 1996). For example, Kost et al. (1999) conducted a study with 56 university students taking a second semester of German as L2 and examined the effect of pictorial and textual glosses and combined (pictorial-plus- textual) annotations on incidental vocabulary. The text was extracted from a Level 3 German reader and the level of difficulty of the text was regarded as a slightly higher than the proficiency level of students. It comprised 20 glossed target words. The students were randomly assigned to one of three gloss conditions and three vocabulary tests, namely production, picture

recognition and word recognition tests, were given immediately. The same tests were given again after two weeks. Based on the results of picture and word recognitions tests, they found that the combined gloss was the most effective of the three gloss categories. As for the production test, there was no significant difference across groups. The researchers conclude that further exploration of preferred learning styles is needed. Jacobs, Dufon, & Fong (1994) compared the effect of glosses with L1 (English), and L2 (Spanish) translation with no gloss use on vocabulary learning. 85 Spanish learners were exposed to a reading text with 613 words and 32 words and phrases that were glossed. After reading the text, the participants were given two unannounced vocabulary tests: one immediately after the treatment and the other, one month later. The immediate test result indicated that the gloss conditions (no matter L1 or L2) were better than no gloss conditions but there was no significant difference between L1 and L2 gloss use on the delayed test. Ko (2012) conducted a study similar to Jacobs et al's (1994) study. 90 Korean students were divided into three gloss condition groups: no gloss, L1 gloss, and L2 gloss. However, Ko (2012) found no significant difference between L1 and L2 glosses on the immediate test, attributing the results to different assessment instruments used in the two studies. In Jacobs et al.'s (1994) study, subsequent translation which requires recall of both meaning and form was used, whereas in Ko's (2012) study a recognition test in the form of multiple-test format was used. Watanabe (1997) carried out a study with 213 Japanese college students using different text modifications in L2 (English), namely appositives, single glosses and multiple-choice marginal glosses for vocabulary learning in context. Single glosses provided the L1 equivalent of the target words. Multiple-choice glosses provided multiple possible meanings and the learners

had to choose the most appropriate definition. He found that the participants with both gloss modifications (single and multiple) retained more vocabulary compared. Watanabe found no difference between single and multiple-choice glosses. This contradicts studies by Miyasako (2002), Farvardin and Biria (2012). Miyasako (2002) examined the effect of L1 and L2 glosses as well as the effect of single and multiple-choice gloss on vocabulary learning with 187 Japanese high school students. Four types of paper-based glosses were created: multiple-choice glosses in L2 and L1 and single gloss in L2 and L1. The students were assigned to one of six groups: four in each gloss condition, no-gloss and a control group (no reading). They were given a text consisting 504-words with 20 identified target words. The students were then subjected to both immediate and delayed vocabulary tests. Miyasako concluded that the students with L2 multiple-choice and single glosses significantly outperformed the students with multiple-choice and single glosses in L1 on the immediate test but no difference was found on the delayed test. He postulates that the difference in the effect of gloss types is correlated with English language ability, meaning that L2 glossing was more effective for higher-proficiency level learners whereas L1 glossing was effective for lower-proficiency level students. Farvardin and Biria (2012) investigated the effect of marginal glosses on reading comprehension with 120 undergraduate Iranian students. The students were assigned to three gloss conditions: single gloss in L1, single gloss in L2 and multiple-choice gloss in L2. They were provided with a 901 word-text with 30 marginal glosses. After they had finished the reading, the students answered reading comprehension questions and took immediate vocabulary test. After three weeks, a delayed vocabulary test was administered. The findings on vocabulary indicate that multiple-choice glosses

in L2 were more effective than single-glosses in L1 both in immediate and delayed tests. Interestingly, that was not the case for single-gloss in L1, that is multiple-choice gloss was not more effective than single gloss in L1 on the immediate test. However the effect of the multiple choice glosses seems to increase over time. Single glosses in L2 had more of an effect on participant's reading comprehension than single glosses in L1 or multiple glosses in L2. This finding is in line with Ko's (2012) study affirming the positive effect of L2 marginal glosses on L2 reading comprehension.

Multimedia Glosses

As technology's integration into teaching has accelerated and CALL has been often implemented both in and outside formal classroom environments, input enhancement with computers has become technologically feasible. These multimedia glosses have been found to be superior to printed glosses in terms of retention of target words in some studies. Lyman-Hager, Davis, Burnett, and Chennault (1993) investigated vocabulary learning and glossing preference of students who were studying French as L2 and compared the effect of glossing preferences on retention. There were two groups. One was exposed to computerized reading with multimedia annotations; the other was exposed to noncomputerized reading text with printed annotations. After the exposure, the students were asked to complete a written recall protocol and a week later they participated in some vocabulary exercises. The study concluded that students with multimedia annotations outperformed the other group in regards to word retention. Gettys, Imhof, and Kautz (2001) focused on the effect of online glossing of the dictionary equivalent form of target words on the retention of these words and found

that readers utilizing an online dictionary format performed better on vocabulary retention than those using contextualized morphological equivalents. They stated that "presenting lexical items in their basic dictionary forms entails deeper mental processing on the part of the learners" which leads to greater retention of the vocabulary (p. 98). This suggests evidence that looking up words while reading may yield better word retention. It is because computerized (online) glosses are a means for helping learners perform bottom-up functions efficiently, thus "relieving the working memory and attention from the burden of cognitive overload and allowing more of reader's attention to move toward top-down processes" and they enable "fast and easy access to meaning of unknown words, making up for insufficiently automatic bottom-up processes" (p. 93).

Pedagogically, two basic advantages of multimedia glosses have been acknowledged for L2 text comprehension and incidental vocabulary learning (Martinez-Lage, 1997): interaction with the text, and activation of both visual and verbal mode processing. In a multimedia environment, learners control their own learning process, interacting with the information presented. More importantly, glosses can be exploited in various multimedia modes (text, graphics, picture, video or sound) stimulating deeper cognitive processing. With pictures, videos and animation added to the text (i.e., definitions), multimedia glosses facilitate students' understanding (Mayer & Moreno, 2002).

Generative Theory of Multimedia Learning (GTML) by Mayer (1997) proposes a theoretical rationale for learning in a multimedia environment. The theory is based on three assumptions: the dual channel assumption, the limited capacity assumption and the active processing assumption. The dual channel assumption stems from *Dual Coding*

Theory (DCT) (Paivio, 1986) which claims that visual and verbal information exist in two separate subsystems in human memory: verbal and visual. The verbal system processes and stores language and abstract information whereas the visual system processes and stores images, sound, and feelings. These systems are independent, meaning that they can exist without the other, but they are also complimentary to each other for active retention of information in memory. When visual and verbal channels are both activated to process the same information, the brain processes two representations of the same information; thus enhancing retention. The limited capacity assumption derives from DCT (Sweller & Chandler, 1991), which assumes that working memory is limited in its capacity to hold information to be processed in each channel, thus, learners selectively attend to certain parts of the information to be retained. For more effective learning, the information should be presented in a way that reduces cognitive load. The active processing assumption suggests that learners engage in the learning process actively by selecting relevant incoming information, organizing the selected information in mental representations and then coherently connecting these representations with prior knowledge. Mayer (2001) revisits these established learning theories and highlights their three main assumptions 1) the separateness of visual and verbal information (dual channels assumptions) 2) the limited nature of each channel (limited capacity assumption), and 3) active involvement in knowledge constructions (active processing assumption). He also posits five principles of instructional design: the multimedia representation principle, the contiguity principles, the coherence principle, the modality principle and the redundancy principle (see the Chapter 2, pp. 20-22). Following the contiguity principles (spatial and temporal), multimedia presentations are

expected to be organized and presented contiguously in time and space, which helps learners to make connections between verbal and visual information, eliminating extraneous media modes and reducing cognitive load which could generally occur by partitioning the presentation of the information (text or picture).

Several studies have proposed that multimedia glosses facilitate L2 reading comprehension as well as vocabulary acquisition. These studies generally confirm GTML in the L2 learning context providing evidence for the effectiveness of dual presentation of vocabulary annotations (Al-Seghayer, 2001; Brett, 1997; Chun & Plass, 1996a; De Ridder, 2002; Hulstijn et al., 1996; Lomicka, 1998; Moazzeni, Bagheri, Sadighi, & Zamanian, 2014; Nagata, 1999; Shahrokni, 2009). With these studies, the path of investigation has shifted from whether printed glosses are beneficial to which multimedia gloss modality is the most effective and whether or not there are significant differences among the gloss modalities for L2 text comprehension and vocabulary learning (Al-Seghayer, 2001; Akbulut, 2007; Chun & Plass, 1996a, 1996b; Shalmani & Sabet, 2010; Stoehr, 1999; Yoshii, 2006; Yoshii & Flaitz, 2002; Yanguas, 2009; Yeh & Wang, 2003; Türk & Erçetin, 2014; Zarei & Mahmoodzadeh, 2014).

Yoshii and Flaitz (2002) tested 151 Japanese ESL university learners at beginner and intermediate proficiency levels and found that annotations with a text and picture combination were more effective than text-only or picture-only annotations; however, there was no significant difference between text-only and text-plus-picture. Yeh and Wang (2003) conducted research with 82 Tawainese EFL university students and found that gloss users had higher scores in reading comprehension and vocabulary acquisition than did no-gloss users. Yet, again there was no significant difference between text-only

and text-plus-visual-plus-audio. It was found that students preferred visual stimuli over auditory stimuli, and did not process information through the auditory channel. This seems to account for the transfer of Taiwanese students' visual strategies from L1 to L2. The result implies that a learners' perceptual learning preference had an impact on the effectiveness of specific vocabulary annotation types.

Al-Seghayer (2001) conducted studies on the effectiveness of multimedia annotation modes on vocabulary acquisition with 30 ESL intermediate level students. The participants were presented with target words annotated in different modes: text, graphics, and video. They were measured in three conditions: definition-only, definition with still pictures and definition with video clips. The students were asked to read the story and then complete a retention test in multiple-choice format. They were also asked to define six annotated words mentioned in the story as a language production test. The results showed that text annotated with video clips yielded the best results among all, and text-only was the least effective mode. He concluded that the dynamic mode (i.e., video) is more effective in helping learners to make mental connections. The results also showed that there was no difference between text-only and text-plus-picture when those two modes were compared. These results contradict with those obtained by Chun and Plass (1996a), who conducted a study with 160 university German students learning English, using a multimedia program that provides annotations through pictures, printed texts, and video. After reading the story, the students were administered a vocabulary test and wrote a recall protocol. The recall for visual annotations was higher than for words annotated with text alone. Al-Seghayer's (2001) findings showed that words with still pictures and definitions were recalled significantly better than words with video and

definitions. Chun and Plass (1996a) attribute this to the pace of the presentation. Because pictures can be viewed for as long as the learner wishes, they allow time for the development of a mental model of the information. Videos, on the other hand, do not allow time for the information to be established in long-term memory because exposure to their presentations is generally short.

A study by Kim and Gilman (2008) also affirms the effectiveness of visuals on vocabulary learning. They note that when text is presented along with graphics, students learn better. Kim and Gilman attribute this to affective reasons like motivation and feeling of success. Şakar and Erçetin (2005) conducted a study with 44 intermediate Turkish students studying English for academic purposes (EAP) at a tertiary level. The study investigated student preferences among hypermedia annotations and the effect of hypermedia annotations on facilitation of L2 reading comprehension. The results show that the students preferred visual annotations to textual and audio annotations. Even though this was the case, annotations that provided videos and audio recordings negatively affected the students' L2 reading comprehension.

Akbulut (2007) investigated the factors affecting vocabulary leaning and L2 reading comprehension with sixty-nine university TEFL advanced-level students at a Turkish university. The students read a glossed text with three types of annotations: 1) definitions of words 2) definitions with pictures 3) definitions with a short video. The groups exposed to the annotations that matched definitions with either a picture or video performed significantly better on immediate and delayed vocabulary post-tests. The study indicates that both picture and video glosses are in fact an effective means for incidental vocabulary learning. There was no clear superiority of one of these gloss

types over another, meaning that there was no significant difference between two visual mode groups (video and picture). This finding contradicts both Al-Seghayer's (2001) study and that of Chun and Plass (1996a). The conflicting results are likely due to the type of tests administered, and also the participants' specific background and language proficiency levels.

Shahrokni (2009) conducted a study to examine the effect of glosses (textual-only, pictorial-only and textual-plus-pictorial) on incidental vocabulary learning with 90 Iranian EFL learners, who were randomly placed into one of three conditions. They took a vocabulary test as pretest. During the treatment, five computerized texts along with 25 target words in total were provided. After reading each text with glossed words, students were asked to take two tests: word and picture recognition tests. The result indicated that a combination of textual and pictorial glosses lead to significantly better incidental vocabulary learning, confirming DCT and previous findings (e.g., Al-Seghayer, 2001; Chun & Plass, 1996a; Yeh & Wang, 2003; Yoshii & Flaitz, 2002). Another result was that students with pictorial glosses performed similarly to the combination group on the picture recognition test whereas textual gloss group did not and had a significantly lower mean. The effectiveness of pictorial glosses was also acknowledged in the study with a suggestion that participants' learning styles (verbalizers and visualizers) could be a factor. Another study highlighting the importance of picture annotations for the recall of target words was carried out by Gasigijtamrong (2013), who conducted a study with 78 Thai students at low-intermediate level to examine the effects of multimedia annotations on Thai readers' word and text recall. The study findings are in concordance with the findings of a number of other research studies that show benefits of accessin more than

one type of media in learning vocabulary. Regarding L2 text comprehension, interestingly, it was found that there was no significance difference across three gloss conditions (textual-only, pictorial-only and textual-plus-pictorial) on L2 reading comprehension performance as assessed through a recall task.

In a similar vein, demonstrating the greater effect of combination glosses over single gloss modes, Yanguas (2009) investigated the effect of L1 (English) textual, pictorial, textual-plus-pictorial glosses on L2 (Spanish) text comprehension and vocabulary learning with 94 native speakers of English at intermediate level of Spanish. Results demonstrated that all multimedia gloss groups performed better than the control group and that the textual-plus-pictorial gloss group outperformed all the other groups. Yoshii (2006) examined the effect of text glosses and text-plus-picture glosses both in L1 and L2. Yoshii divided 155 EFL Japanese students into four groups: L1 text-only, L2 text-only, L1 text-plus-picture and L2 text-plus-picture and assigned the students to read an online story with some glossed words. They then received an immediate posttest and two weeks later, another posttest was given. Each posttest comprised of a definition-supply and recognition tests. The results indicate that irrespective of the language of gloss types, both L1 and L2 glosses were effective for incidental vocabulary learning. The findings of the comparison between text-plus-picture and text-only glosses noted significant difference in scores of definition-supply test, but not in recognition tests, supporting DCT. As for the delayed tests, he found that long-term retention rate of the group exposed to L1 text-only glosses was significantly greater than other combinations (L2 text, L2 text-plus-picture, L1 text-plus-picture). Shalmani and Sabet (2010) conducted a study with a group of 120 Iranian EFL university students and investigated

the effect of three types of multimedia glosses on L2 reading comprehension. Being assigned to one of the three gloss groups (textual-only, pictorial-only, textual-plus-pictorial) and having read five academic passages with the glossed words, students took immediate comprehension tests in a multiple-choice format. The results, confirming DCT and CTML, showed that textual-plus-pictorial group outperformed the other two gloss groups while the pictorial-gloss group outperformed the textual-gloss group.

Zarei and Mahmoodzadeh (2014) randomly grouped 65 Iranian high school students into one of the four conditions: one control, three multimedia gloss groups, namely textual-only, pictorial-only and textual-plus-pictorial. The students were given a pretest and two posttests (L2 vocabulary production and reading comprehension) immediately after the treatment. The result showed that students with access to multimedia glosses outperformed the control group in terms of L2 vocabulary production, but there was no significant difference among three glossed conditions. As for the L2 reading comprehension, there was no significant difference between the groups. The researchers mention three factors that might have led to this result: new computerized instructional method that students might not have accommodated, low proficiency level of students that affects the link between glossed words and text comprehension negatively, and individual differences in imagery processing abilities. Tabatabaei and Mirzaei (2014) conducted a study with 60 university students who were placed into four groups (3 gloss groups plus a control group). Some of the idioms in three computerized passages were glossed and hyperlinked. When clicked on, hyperlinked idioms provided the definition of the idiom in English (textual-only group), as a picture (pictorial-only), or as a combination (textual-plus-pictorial gloss group) in a

new window. The control group read the online texts without access to glosses. The results show a significant difference between the multimedia gloss groups and the control group in L2 reading comprehension and idiom production. Additionally, there was statistically significant difference in the performance of the combination group and all other groups (textual and pictorial) on L2 text comprehension and idiom production. This contradicts with the finding of Tabatabaei and Mirzaei's (2014) study indicating that there was not significant difference among three glossed conditions in terms of L2 vocabulary production.

In another very recent study, Türk and Erçetin (2014) examined the effects of presenting visual and verbal multimedia information interactively versus simultaneously on L2 vocabulary learning and reading comprehension with low-proficiency learners of English. Interactive display condition allowed learners to choose the type of multimedia information (either textual-definitions of words or visual-associated pictures) whereas the simultaneous display provided textual information along with associated pictures at the same time. The researchers also examined participants' interaction with the text, analyzing the frequency of gloss lookups, the amount of time spent in viewing the glosses and total amount of time spent on reading the text. They found that the simultaneous display of visual and verbal information led to better performance on vocabulary tests. Additionally, they found that participants are more engaged with the text when verbal and visual information are presented together than when the participants have control over the choice of multimedia type. That is, allowing students control over their access to gloss types did not facilitate incidental vocabulary learning. As for the reading performance, participants exposed to verbal and pictorial glosses

outperformed the group with the choice over the multimedia gloss type on the multiple-choice reading comprehension. However, there was no significant difference between the scores of two groups on the recall test. The researchers explain this with the test type effect. Recall tests necessitate test takers' ability to attend/hold main ideas and salient information whereas multiple-choice tests can assess different levels of text processing such as making inferences.

In addition to the studies that investigated the effectiveness of glosses through offline behavioral measures, tracking the learner behavior online has been an interest in some gloss studies that aim to investigate the correlation between lookups and reading comprehension and retention. For example, Laufer and Hill (2000) investigated 32 Israeli and 40 Hong Kong university learners to investigate a relationship between lookup of five different types of glosses for target words (1) word pronunciation, (2) meaning in English, (3) L1 translation, (4) lexical root, and (5) extra information (various forms of the word, register, collocation, synonyms, etc.) in an online reading text in English (L2). Built-in tracking systems recorded the gloss lookup behavior of students each time they clicked on the gloss. After reading, they were instructed to take an unannounced comprehension and vocabulary (recall) test. From the frequencies of tracking data, and the test scores, it was found that recall of the looked up words was in a range from 33.3% to 62%. The students' lookups were correlated with vocabulary retention. It was a weak correlation (r = .35) for the Israeli students and it was even low and insignificant the Hong Kong group (r = .24). The researchers attributed the differences to Hong Kong students' feeling of ownership and task completion, and diligent involvement in learning tasks. The findings might be accounted for by the fact

that the five types of lookup behavior differ from each other qualitatively as regards to immediate vocabulary retention. Stronger correlations could have been found if each different lookup behavior had been correlated separately with vocabulary retention. Replicating Laufer and Hill (2000), Lew and Doroszewska (2009) conducted a study with 56 Polish students to investigate the effect of individual lookups on vocabulary retention. Students were instructed to read an online text with ten glossed words for general comprehension. For each target word, L1, L2, animated picture and example of use were available. The students were then asked to take vocabulary retention and reading comprehension tests. L1 equivalent lookups of the words were the most commonly utilized gloss type and the example of use was the least commonly utilized gloss. The retention rate of words (56.6) was higher than the Israeli students, but slightly lower than the Hong Kong students in Laufer and Hill's (2000) study. The reason for high retention rate was attributed to five factors: salience of target words, flexibility to be able to look up the words, text content, availability of L1 translation (L1 gloss), and engagement of the CALL activity. The popularity of L1 lookups also corresponds to Laufer and Hill's (2000). Lew and Doroszewska highlight a very crucial point that it is not the quantity of lookups that causes retention; rather it is the quality, meaning that what kind of entry or gloss is looked up. Interestingly, as stated in both studies, the retention may not occur due to the high frequency of lookups.

De Ridder (2002) investigated the effect of hyperlinks on students' lookup behavior, text comprehension, and word retention. Students tended to click more often on words in a text when visible hyperlinks were provided, but this did not result in better text comprehension and word retention. Examining the effect of multimedia annotations

on incidental vocabulary learning, Chun and Plass (1996a) also investigated the relationship between lookup behavior and vocabulary test performance. The findings showed that the frequency of the lookup behavior does not indicate better performance in the vocabulary test due to the features of the multimedia mode. The researchers explained that still pictures could be viewed as long as the learner wished. Each learner then had sufficient time to process the information cognitively. On the other hand, the videos showed in the study were short, thus they provided less time for learners to make connections during cognitive processing and keep the information in long-term memory.

Hulstijn (1993) conducted two experiments with 82 Dutch high school students to investigate their word lookup behavior considering variables such as goal of reading, word relevance and ease of word inference. The students were randomly assigned to one of two groups in terms of reading goal: reading for summary versus reading for answering of questions. Students in the summary group were instructed to write a short summary of the text after reading. Students in the question group were instructed to answer the comprehension questions. Glosses that provided translation of the word in L1 (Dutch) were presented through a pop-up window. Based on the test results and computer logs of the students' cursor movements, Hulstijn (1993) discovered that relevant words in terms of reading goal were looked up more frequently than irrelevant words. Students who had to write summary looked up more words than the students who had to answer comprehension questions. Another finding was that words whose meanings were easily inferred from the context were looked up less frequently than words that were not so easily inferred. Furthermore, students with greater vocabulary knowledge looked up fewer words than students with smaller vocabulary knowledge.

However, no significant difference in the number of words looked up was found between students with high inferring ability and students with low inferring ability. Hulstijn (1993) also found that there was no significant difference between students having maximal strategy (looking up almost all words) and students with minimal strategy (looking up none of the words or only one word) in terms of vocabulary knowledge and word inference skill. With these findings, he argues that decision to look up words is influenced by reader's perception of word relevancy to the task, but not their ability to infer the word meaning from the context.

In step with Hulstijn (1993), Knight (1994) investigated the effect of dictionary access on reading comprehension. A computer program was created to record the number of words each student looked up and the amount of time each student spent reading an article. 112 undergraduate Spanish learners at intermediate level first took the American College Test and then were categorized as either low or high verbal ability students based on their verbal score on the test. Afterward, they were randomly assigned to either dictionary access or no dictionary access groups. Knight found that low verbal ability students were more dependent on vocabulary knowledge than high verbal ability students and that the relationship between reading comprehension and access to word lookup was significantly larger for the low verbal ability group (r = .68) than for high verbal ability learners (r = .15).

Yoshii (2013) also tracked the lookup behaviors of 41 Japanese EFL students, examining the effect of gloss types (single versus multiple) on vocabulary learning through reading. All but six students looked up glosses as single glosses. Yoshii (2013) explains the reason for some students not referencing the dictionary was good reading

comprehension. Those students had no need for supplementary annotations and thus skipped looking up words with the glosses. In the multiple glosses, all students looked up the glosses; however, they did not necessarily choose the correct meanings. This illustrates that a high number of lookups does not guarantee high vocabulary retention.

Tracking time spent on reading and viewing annotations, Erçetin (2003) explored the types of annotation 84 ESL students (intermediate and advanced) used while reading online text and monitored learners' behavior while reading. Although intermediate ESL students accessed annotations more frequently than advanced students, advanced students outperformed them in reading comprehension. The frequency of lookups does not indicate or guarantee better reading comprehension. This finding is in line with the findings of the studies by Chun and Plass (1996b), De Ridder (2002), Laufer and Hill (2000), Lew and Doroszewska (2009). However, it contradicts with Bensalem and Aust's (2007) study. Bensalem and Aust (2007) conducted a study to investigate the effect of glosses on reading comprehension and vocabulary acquisition with 93 second language Spanish learners at the intermediate level. They confirmed the superiority of multimedia glosses over no-gloss use. Furthermore, they found that the quantity of access to glosses was positively correlated with comprehension and vocabulary scores. That is, the more frequently second learners looked up glosses, the better they comprehended and acquired new words.

Up to this point research related to L2 reading and incidental vocabulary learning has been presented. Unfortunately, other language skills especially L2 listening has not been studied in relation to the effect of glosses as much as L2 reading has. This might be due to the fact that the nature of listening is spontaneous and has a flow, whereas

reading text is static. Given the fluid nature of listening it might not be easy or technically feasible to insert glosses into listening. Nonetheless, there are still a few of studies that have focused on the effect of annotations (glosses) on L2 listening and incidental vocabulary learning. The following sections will report these studies with their findings and implications in details.

Previous Gloss Studies on L2 Listening

Following the high volume of gloss studies in L2 reading comprehension and incidental vocabulary learning, Jones (2003, 2004, 2006), and Jones and Plass (2002) conducted studies to investigate the effect of multimedia glosses (dual mode vs. single-mode in L1) on incidental vocabulary learning in the L2 listening context. As the first study in the series, Jones and Plass (2002) investigated how effective multimedia glosses were in promoting L2 listening comprehension and vocabulary learning. They worked with 171 English-speaking university students taking French as L2. The students were randomly grouped and assigned to one of four listening conditions: (1) no-annotations (2) textual-only annotations (3) pictorial-only annotations (4) textual-plus-pictorial annotations (the combined gloss group). They all listened to a short aural text in French and initially took a pretest to assess their vocabulary knowledge before the treatment. A multiple choice vocabulary posttest and recall protocol comprehension test were administered both immediately and three weeks after the treatment. The results point to the superior performance of gloss groups over the no annotation group in terms of immediate and delayed vocabulary tests as well as text recall. Among the gloss groups, the combined group performed significantly better than those who had access to either pictorial or

textual annotations on the immediate vocabulary test, but the performance of combined group and pictorial group was not significantly different on the delayed test. Additionally, there was no significant difference between the two single gloss groups in both tests. As for listening comprehension, the combined gloss group outperformed students in other gloss groups and no-gloss group on the immediate comprehension test. On the delayed comprehension test the superiority of listening performance of the combined gloss group over the others remained the same except for the fact that textual-only and no-gloss groups did not differ significantly in their performance as they did on the immediate listening comprehension test. It can be inferred that the effect of textual-plus-pictorial annotations was "stronger and longer-lasting" than textual-only annotations both in vocabulary learning and listening comprehension (p. 557). These results are consistent with Mayer's (2001) GTML. The key finding of Jones and Plass' (2002) study confirming CTML was reconfirmed by a follow-up qualitative study by Jones (2003), in which she explored 20 learners' reflections of the gloss use experiences in L2 listening and vocabulary learning in the first study and found the superiority of textual-plus-pictorial glosses over no-glosses in L2 listening comprehension and vocabulary recognition.

Jones conducted two additional studies in one (Jones, 2004), which were enhanced by adding another vocabulary test. She found that the use of recognition test only as the indicator of vocabulary learning was a significant limitation of the first study. Jones worked with a total of 147 English speaking students of beginning French (80 students for the first study, 67 students for the second study) assigned to one of four annotations group: (1) no-annotations (2) textual-only annotations (3) pictorial-only

annotations (4) textual-plus-pictorial annotations. In the first study, students in three gloss annotations outperformed students who received no annotations during listening in two types of multiple-choice recognition tests: textual recognition (English translation) or pictorial recognition; however, the glossed groups did not significantly differ from each other either on immediate or delayed tests of textual and pictorial recognition. In the second study, students had the same treatment in one of the four annotation groups and also received both immediate and delayed vocabulary production tests. It was found that students performed best in the production of English translation of the target words when the mode of vocabulary assessment matched the gloss types (either alone or combined) in treatment. That is, pictorial-plus-textual annotation and textual-only annotation groups recalled more words than those students with no written annotations. Based on the tracking data, Jones (2004) also stated that students in the combined gloss group did not use glosses as expected and proceeded without them. This was likely due to the fact that there was too much information to grasp. The students in the combined group subsequently performed more poorly than textual-only group on the written production test. This was interesting as the combined group had richer input modification but over time, the retained information decayed. Furthermore, in this study, she acknowledges the risk of wide associations/connections that an image can bring to the verbal presentation of that image. This richness of connections might have affected students' performance in translating L2 words into L1 by looking at the image.

In a later study, Jones (2006) expanded upon her research and investigated how collaboration (peer-to-peer) strategies and combined (textual-plus-pictorial) glosses affected incidental vocabulary learning in L2 listening. She worked with 68 English

speakers of beginning French randomly assigned to one of four annotation groups: (1) alone, no annotation (2) in pairs, no annotations (3) alone, textual-plus-pictorial annotations (4) in pairs, textual-plus-pictorial annotations. After listening to a story interacting with annotations or taking notes with their partner, the students took two tests: listening recall protocol tests and written vocabulary recognition and recall tests. Students in both annotation groups (either alone or in pairs) recalled or identified vocabulary best. Annotations had a significant effect in recall while the collaboration had no measurable effect. Students who worked in collaboration with combined annotations had the highest listening comprehension. The interaction pattern may have enabled students make connections between words; make educated guesses about the listening text, share notes or thoughts about the text and in turn comprehend the text better. The findings suggest that collaborating with peers and accessing the pictorial-plus-textual annotations in a multimedia L2 listening context facilitates vocabulary recall and L2 listening comprehension. Overall, with the four studies cited above, Jones found empirical evidence of the significant effect of textual-plus-pictorial annotations on L2 listening comprehension and incidental vocabulary learning.

Following the studies by Jones and Plass (2002), Cottam (2010) conducted a study with 95 university students of beginning Spanish to investigate the effects of textual and visual annotations on listening comprehension and vocabulary acquisition. The students were randomly assigned to one of four groups: no-annotations, textual-only, visual-only, and textual-plus-visual. They were instructed to complete an online multimedia listening activity consisting of textual and visual annotations of 35 key words mentioned in the aural text. Students in the no annotation group did not receive

any annotations at all. Open-ended listening comprehension questions, and a multiple choice vocabulary test with L1 translation of possible answers, as well as a survey (for the measurement of cognitive load and general attitudes towards the multimedia program) were administered. The results indicated that textual-plus-visual annotations had a significant positive effect on L2 listening comprehension (η^2 =.058). That is, students who received a combination of textual and visual annotations identified significantly more propositions than the other three groups (no annotations, textual-only, visual-only). Additionally, students reported positive attitudes towards multimedia listening with vocabulary annotations. The finding for visual annotations was inconsistent with the findings of the studies by Jones and Plass (2002), and Jones (2004); nonetheless, they were in line with a study by Ariew and Erçetin (2004). Ariew and Erçetin found no significant effect of textual and contextual annotations (textual text, audio, graphics annotations and contextual text, audio, graphics, video annotations) on L2 reading comprehension for both inmediate and advanced group of students while there was a significant negative effect of video and graphic annotations (visuals) on L2 reading comprehension of intermediate students. The result was strikingly interesting. Although the students reported a preference for visual annotations of keywords, these annotations had a negative effect on their L2 reading comprehension.

Another study that shed a light on the effect of gloss use on L2 listening comprehension was conducted by Maleki and Rad (2011). They compared the effect of static images with the effect of condensed text with verbal stimuli on listening comprehension tests supplemented with visual or textual input. 58 Iranian EFL students were selected on the basis of a standardized listening test and divided into two groups:

high proficiency listeners and low proficiency listeners. These listeners were further divided into two groups: one receiving static images with verbal stimuli, the other group with the condensed script with the same verbal stimuli. They all took three listening tests and the results indicate that students who received the listening tests with static images outperformed the students receiving tests with only the condensed script. Visuals were more advantageous to low proficiency listeners whereas the textual glosses were more beneficial to high proficient students.

Filling the gap in the field of L2 listening and gloss use in multimedia context, these studies have paved the way for improved applications and more empirical research on gloss use in L2 listening in CALL/MALL context. As stated before, the studies on gloss use in L2 listening studies in CALL are rather few in numbers, so it may seem challenging to design effective MALL contexts for testing the effect of gloss use on L2 listening comprehension. However, the practice of multimedia listening through a mobile learning environment (through mobile devices) is becoming more common in application with different perspectives as to the role of L2 listening through mobile learning platforms. These studies set a precedent for testing the effect of particular input modalities (hereby gloss use) on L2 listening comprehension and their findings encourage other researchers to fill the gap in the L2 listening in a mobile environment.

CHAPTER 5

METHODOLOGY

This chapter explains the methods and procedures used in this study. Research questions are presented along with their hypotheses. Treatment, participants, the materials and instruments used in the data collection procedure are also presented. The screenshots of each listening condition are also provided in the treatment part. Finally, the data collection and analysis procedures are each explained in detail.

Research Questions

The current study is designed to investigate the effects of gloss types on listening comprehension and incidental vocabulary learning in the L2 in a MALL environment. It also aims to examine what types of listening and gloss use strategies learners employ in such an environment. Finally the effect of control by the L2 learner over the listening process, i.e. self-regulation has been investigated. Although there are a considerable number of studies that have explored the effects of gloss types on L2 reading comprehension and incidental vocabulary learning as a byproduct of reading (Ariew & Erçetin, 2004; Chun & Plass, 1996a, 1996b; Farvardin & Biria, 2012; Ko, 2005; Sadeghi & Ahmadi, 2012; Türk & Erçetin, 2014), few studies have examined the effects of glosses on L2 listening comprehension and incidental vocabulary learning through listening (Cottam, 2010; Cottam & Savenye, 2008; Jones, 2003, 2006; Jones & Plass, 2002). Previous studies have demonstrated the beneficial effects of dual-mode glosses (i.e., textual-plus-pictorial) over single-mode (textual-only, or pictorial-only) ones or no

glosses on listening comprehension and incidental vocabulary learning. However, the available studies were conducted in a computer environment, not in a mobile environment.

Unlike the effects of glosses on listening comprehension, factors affecting processing and comprehension of aural input such as flexibility to control the aural input, the use of listening strategies and gloss use strategies, have not been investigated systematically. The purpose of the current study is not only to investigate the effect of single mode versus dual mode glosses on L2 listening comprehension and incidental vocabulary learning in a mobile leaning environment but also to explore the listening and gloss look up strategies used by L2 learners when learners are given to regulate the listening task in this environment.

The study addresses the following research questions:

1. Does access to glosses affect L2 listening comprehension and incidental vocabulary learning in a MALL environment? If yes, are there significant differences between single-mode (i.e., textual-only, pictorial-only) and dual-mode (i.e., textual-plus-pictorial) glosses?

2. Are there differences between single-mode glosses (i.e., textual-only, pictorial-only) and dual-mode (i.e., textual-plus-pictorial) glosses in terms of frequency of access to glosses and duration of the listening task?

3. Are frequency of access to glosses and time spent on task related to listening comprehension and incidental vocabulary learning when learners are exposed to single-mode vs. dual-mode glosses?

4. Does self-regulation during listening affect listening comprehension, incidental vocabulary learning, and the duration of listening the task?

5. What strategies do L2 learners use when they are allowed to self-regulate the listening process?

6. What strategies do L2 learners use to access glosses during listening in a MALL environment?

Following Paivio's (1986) DCT and Mayer's (2001) GTML as well as the theoretical arguments in favor of learner control or self-regulation in multimedia learning environments, the current study aimed to test three hypotheses in relation to Research Question 1 and 2. No hypotheses were formed for Questions 3-6 since they were exploratory in nature.

Hypothesis 1: Participants with access to glosses will outperform those with no access to any type of glosses in terms of L2 listening comprehension as well as recognition and production of target words in the L2, based on the research which have shown that textual and pictorial information provided with a L2 aural text during listening enhances listening comprehension (Chung, 1994; Garza, 1991; Herron, Hanley, & Cole, 1995; Jones, 2006; Jones & Plass, 2002; Pouwels, 1992).

Hypothesis 2: Participants who access textual-plus-pictorial glosses will show better performance than those who have access to only pictorial or only textual glosses in terms of L2 listening comprehension as well as recognition and production of target words in L2, based on DCT and the multimedia principle of GTML. Studies, albeit being few, have confirmed the beneficial effects of textual-plus-pictorial glosses on

listening comprehension (Cottam & Savenye, 2008) and incidental vocabulary learning through listening (Jones, 2004, 2006; Jones & Plass, 2002).

Hypothesis 3: It was expected that the participants in no-gloss-self-regulation condition would spend longer time on the task since they would be more engaged with the task as active listeners. Given the facilitative effects of self-regulating strategies on the listener's performance in aural comprehension (e.g., Roussel, 2011) as well as research on learner control in multimedia learning environments indicating that learners who could control the pace and sequence of hypermedia materials had significantly improved recall scores compared to pace and sequence set by the computer (e.g., Yeh & Lehman, 2001), it was hypothesized that self-regulation would lead to better text recall and vocabulary scores compared to no self-regulation.

Listening Application

A listening application for mobile device was developed and optimized for Samsung Galaxy Mini devices with the help of a software developer. The features of the application were determined by the researcher and generated by the software developer using Java programming language and Android SDK package. Due to the fact that available devices were low-end phones with low resolution screens and limited hardware capabilities, the user interface (UI) of the application is designed very minimally to increase overall readability, usability and performance.

In order to record data for further analysis, the application connects to a web service continuously. The web service was developed with PHP language, MySQL database and JSON data interchange standard. At the beginning of each activity, the

application connects to web service and downloads the type of experiment and duration of the experiment, which were configured by the researcher. The participants were given very limited control over the system in order to prevent user errors. Also, to keep data loss at minimum, each physical activity of the participants is separately, immediately and synchronously sent to the web service and recorded in the database. This method also decreased the load on the web service and increased device performance.

The last component of the system is a web control panel written with HTML and PHP languages, and controlled by the researcher. With this panel, the researcher can change system settings, download data of participants as spreadsheets involving name and surname of the participants, identification of condition, total time spent, physical movement of the participants and glosses looked up, and activate the conditions before the treatment starts and terminate them when the treatment is over.

Treatment Material

The treatment material had two components. The first one was an audio file that was a 13.56-minute-long story taken from the website of Voice of America, an official American broadcast for audiences outside of the USA. It broadcasts news about the United States and the world in English as well as 53 languages. It also provides language learning programs in multimedia format under the section Learn English. The audio file used in this study was downloaded from the Audio-American Stories in the Learn English section. The title of the story was Judge and it was written by Walter D. Edmonds (see Appendix A). The reasons why this story was chosen were the pace and the lexical features of the story. The pace was well-adjusted for foreign language

learners to grasp what was being said and the words in the story were easy to gloss. The other component of the material was glosses. To identify which words were to be glossed, the script of the story was checked and then forty-three words to be glossed were selected as appropriate to gloss. Of these forty-three words, certain target words were identified. To do this, the frequency of the words were checked through the Corpus of Contemporary American English (COCA), which contains millions of words of spoken, fiction, popular magazines, newspapers, and academic texts between the year 1999 and 2012. The frequency of the words having been checked, twenty-five words with highest frequency were listed as target words to be assessed after the treatment. The frequency range of the target words varied between 55,857 and 5,031 occurrence. Ten of the target words were nouns, twelve were verbs and three were adjectives.

For the best representation of these target words on the application, expert opinions were needed. The researcher recruited six experts, English language instructors, who had been teaching English at the tertiary level for at least ten years. Also, a document on which some Turkish equivalents of the word were written was created, and next to it, three images were placed. For the meaning of the words in Turkish, the Redhouse bilingual dictionary was referenced. And for the images, Google Images was used as the resource. The researcher, then, provided the story to the experts and consulted them about the most appropriate equivalent Turkish meaning of the words and also best representative pictures of the words. The document was then submitted to the English instructors via email and they were requested to give their opinions about the meaning of the words in text and picture. They were also asked for options if they thought the words were not represented correctly and appropriately. They got back to

the researcher in two weeks' time, choosing the appropriate word meaning and the picture in the list according to the discourse of the story and wrote their comments. The researcher checked the responses, listed meaning and images agreed upon by the majority, and then made a final list of words with negotiated meaning in Turkish and pictures for glossing. After selecting the word meaning and images, three types of glosses (textual-only, pictorial-only and textual-plus-pictorial glosses) were created. The glosses were integrated into the application and the words appeared on the screen as text, picture, both or none through five types of experimental conditions.

Experimental Conditions

A total of five conditions were tested. These are, namely, no-gloss-no-self-regulation, no-gloss-self-regulation, textual-only, pictorial-only, and textual-plus-pictorial conditions. Each condition was provided with the listening text (story) with the choice of listening twice. In addition to this, in each condition, there were two common features: a login page and the instruction before the participants listened to the text. The login page asked name and surname (see Figure 4).

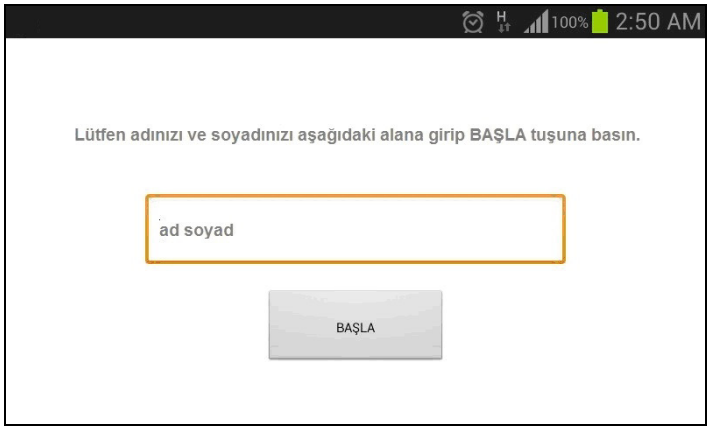


Figure 4. A screenshot of logging in.

After participants logged in, the story was downloaded and the participants were taken to the next information box in which they were exposed to one of the five conditions. Logging in was common in all conditions; however, the instructions afterwards were specific to each condition (see Figure 5).



Figure 5. A screenshot of the instruction before listening to the story.

Each condition was provided Bitir (Stop in English) and Tekrar Dinle (Repeat in English) buttons. When the participants clicked on Bitir, they were asked if they were sure that they wanted to exit the program or they would like to go back to listening it again (see Figure 6).

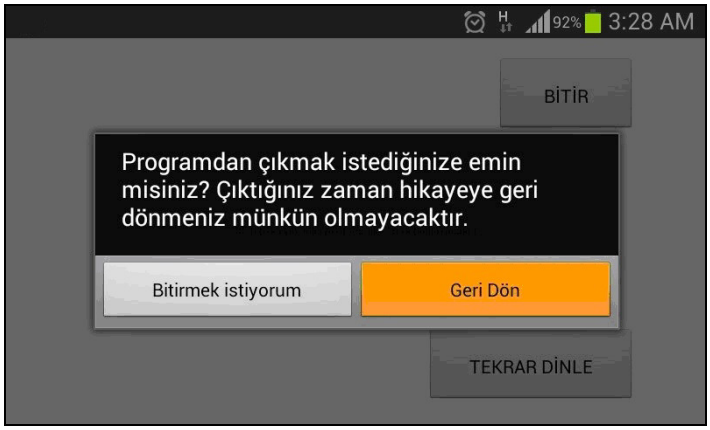


Figure 6. A screenshot of ending the program.

No-gloss-no-self-regulation Condition

This condition fell short of any visual enhancement or control button for the participants to regulate the listening text (see Figure 7). This condition violates the multimedia principle proposed by CTML, which suggests that learning with words and pictures is better than learning with words or pictures alone (Mayer, 2001). This condition is, therefore, expected to generate the least effect on learning, specifically poorest listening comprehension and incidental vocabulary learning.



Figure 7. A screenshot from the no-gloss-no-self-regulation condition.

No-gloss-self-control Condition

Like no-gloss-no-self-regulation condition, in this condition, the audio file without any glosses was provided. However, self-regulation mechanism was integrated as in all three conditions with glosses. That is, the buttons for Oynat (Play)/Duraklat (Pause), Başa Dön (Rewind), Bitir (Stop), the flexibility to rewind was provided to the participants so that they could go back and forward while listening (see Figure 8). Roussel (2011) implies that flexibility of listeners to better handle what they are listening to and tracing

their movement could be an indicator of listening intake strategies in individual listening. Self-regulation strategies, as she finds out, allow listeners better handle aural text. Therefore, this condition was expected to generate better results in listening comprehension when compared it with no-gloss-no-self-regulation condition.

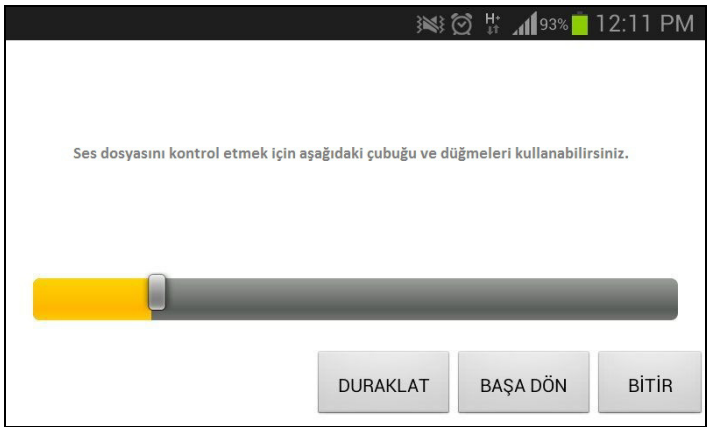


Figure 8. A screenshot from the no-gloss-self-regulation condition.

Textual-only Condition

Participants in this condition were exposed to only textual glosses, where they could have access to the textual meaning of the words in Turkish while they listened to the audio file. They could scroll down and click on the words they hear and the word would appear on the screen in text form (see Figure 9). This condition was created to set the single mode (textual-only here), which has been found to be less effective than dual mode (Al-Seghayer, 2001; Chun & Plass, 1996a, Jones, 2004; Jones & Plass, 2002) and to see if this study would replicate previous results in comparing the effects of single mode and dual mode over listening comprehension and incidental vocabulary learning.



Figure 9. A screenshot from the textual-only condition.

Pictorial-only Condition

In this condition, pictorial glosses were provided to the participants so that they could look up the meaning of the words on the screen when they heard them in the audio text. Like textual-only condition, it was set up to create the other single mode (pictorial) of presentation and examine its effect on listening and incidental vocabulary learning in comparison with the dual mode (see Figure 10).

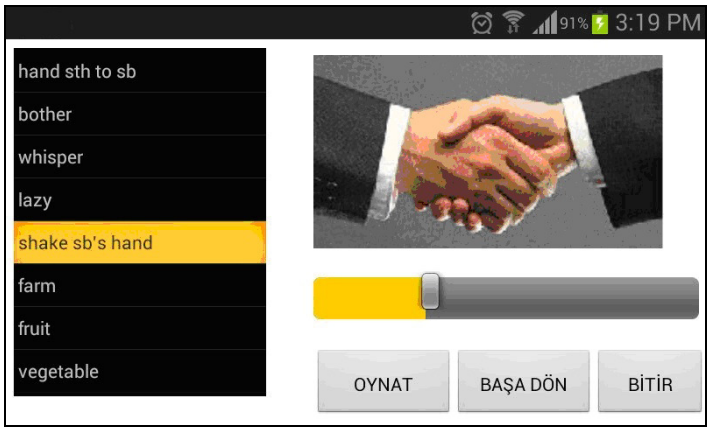


Figure 10. A screenshot from the pictorial-only condition.

Textual-plus-pictorial Condition

Participants were exposed to the audio file in which the words were represented both textual and pictorial glosses (see Figure 11). That is, this condition was the combination of two single modes (textual-plus-pictorial) and it was expected that participants in the textual-plus-pictorial condition would outperform participants receiving single-mode glosses or no gloss at all in listening comprehension and incidental vocabulary learning (Jones, 2003, 2004, 2006; Jones & Plass, 2002).

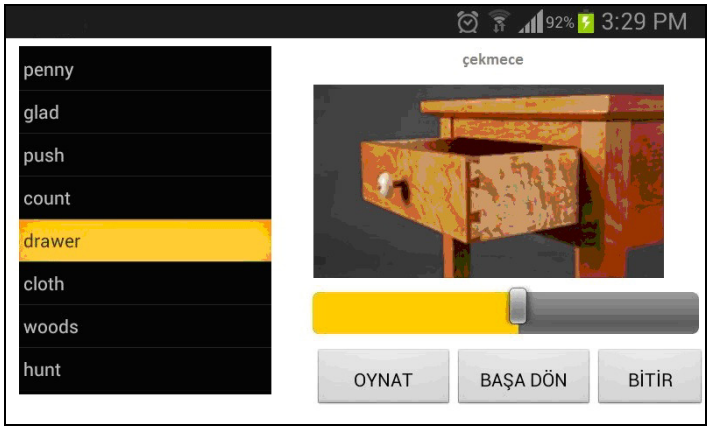


Figure 11. A screenshot from the text-plus-picture-condition.

These conditions were activated by the researcher and the participants who were randomly assigned to one of these conditions were able to get access them in a real classroom setting. Two classrooms were set up with two routers in each of them. The conditions were administered at different times so as to avoid any inappropriate communication between the participants before they were exposed to the treatment.

Participants

Due to practical considerations such as geographical proximity, easy accessibility to treatments and volunteers, convenience sampling was used in this study. The sample was recruited from the Faculty of Economics and Administration Science, Mersin University. It consisted of 116 freshmen students studying Public Administration, Management, and Economics. The medium of instruction is in English for %30 of the curriculum subjects. Therefore, for the admittance to the faculty's programs, students are required to prove English proficiency by completing one year of English Language Preparatory Program (ELPP) and passing the final exam at the end of the academic year with a minimum score of 70%. Alternatively they may submit the minimum score of 60 of a national foreign language test or score 198 in the computer based TOEFL or a minimum score of 4 in the IELTS at the beginning of the academic year to exempt them from the ELPP. All of the participants in the study enrolled ELPP and passed the final exam at the end of the previous academic year. Ninety nine of them were registered as elementary students and seventeen of them were preintermediate students. After completing the program, they also had to take 4 hours of Compulsory English during their first year of study to assist them with the courses where the medium of instruction is in English. The researcher was the students' instructor for Compulsory English course for two semesters in the first year of academic program at the faculty. At the beginning of the study, the instructor applied the Oxford Placement Test 1 (New 2004 edition) to determine the level of the students before the treatment. The test had two sections: Listening and Grammar. Each had 100 items. The listening test included some statements, which could cause a failure of communication or transmission of the wrong

message due to the phonological features of the statements. The grammar test was a multifaceted test of grammatical and lexical items. Grammar was tested in regards meaning and syntax. Of all test takers (n=202), there were 31 basic-extremely limited users (equivalent of Common European Framework (CEF) Level A1 Breakthrough), 86 elementary-limited users (CEF A2 Waystage) and 75 lower intermediate-modest user (CEF B1 Threshold-independent users) and 10 upper intermediate-competent user (B2 Vantage-independent user). The upper intermediate group was eliminated from the study. Thus, the sample consisted of students who were at A1, A2 and B1 levels on the CEFR scale. These students were assigned to one of the following five conditions: (1) no-gloss-no-self-regulation, (2) no-gloss-self-regulation (3) textual-only gloss (4) pictorial-only gloss, and finally (5) textual-plus-pictorial glosses. Since some of the students did not show up for the treatment and the data for some students were not usable because they were incomplete, the sample size for each condition was as follows: 23 in Condition 1, 24 in Condition 2, 22 in Condition 3, 24 in Condition 4, 23 in Condition 5.

Data Collection Instruments

Two sets of data collection instruments were used. The first set included the instruments that were used to answer the research questions such as free recall task, and four vocabulary tests that were administered immediately after the treatment. The second set was used to control for possible confounding factors and included placement test and pretest. The placement test aforementioned was administered three months before the treatment. And two weeks before the treatment pretest was administered. The

pretest included 25 sentences in L2 including the target words of the text and the students were instructed to write L1 translation of these sentences (see Appendix B).

Free Recall Task

Free recall test has been suggested as a method of assessing students' learning capacities and comprehension in reading as a language skill (Morrow, 1988; Salvia & Hughes, 1990), therefore, for many years, reading inventories employed free recall as a measure of reading comprehension over the standardized tests (Leslie & Caldwell, 1990). In this study, it was used as an explicit measure of L2 listening comprehension in which participants were asked to write down as much as what they could remember in their native language, Turkish, in any order (see Appendix C). The use of L1 was asked on purpose to measure the comprehension. Time limitation was not set up so that participants could freely reconstruct the audio text. Although used as an alternative method of assessment of comprehension, free recall task as valid instrument for assessing comprehension was argued. Myers (1990) states that free recall test might be regarded as memory test to recall knowledge. The scoring was regarded time-taking (Fuchs, Fuchs, & Maxwell, 1988) and had some validity and reliability issues since a text was divided into meaningful segments. All of these idea units have equal value in scoring. Single units however might not have equal importance in overall meaning of the text (Wells, 1986). To avoid such a problem, in this study, free recall tasks was evaluated based on pausal units of listening text following the procedures of Johnson (1970). That is, the text was divided into linguistic pausal units according to pausal

locations where a reader/narrator catches a breath often to enhance meaning or to emphasize the text. The participants' written recall protocol was evaluated with the pausal units. This method was preferred not only for the assessment but also for practicality. Brown and Yule (1983) stated that it is difficult to analyze a text on the basis of propositions because identifying propositions is subjective. Alderson (2000) suggested utilizing propositional units for recall-protocol tasks since it is time taking, reciting Bernhardt's (1991) study between 25 and 50 hours for analyzing a 250 word text. The present study used a 2594-word listening text and obviously using prepositional units for the recall-protocol task was impractical. Therefore, the pausal unit protocol was utilized for assessing listening comprehension.

A total of 365 pausal units based on the narrator' pause locus was identified. Each pausal unit received one score. The segmenting of the protocols into pausal units was carried out independently by two raters; the pausal units were then compared and checked to ensure reliability. The inter-rater reliability of the written recall protocol is 0.93. Disagreements were solved in conferences.

Vocabulary Tests

Four vocabulary tests were developed based on the tests used in studies by Laufer and Goldstein (2004), and Waring and Takaki (2003). Small-scale piloting in which 15 participants (three for each condition) with the similar language proficiency levels was carried out. After piloting, the modification of the questions was done, and time slot for each of them was reset. The vocabulary tests were given to the participants in a fixed order (checklist, L2 meaning production, L1 meaning production and bilingual synonym

match respectively) so as to avoid any confounding effects such as seeing and remembering the word from the previous text. As the tests aimed to measure incidental vocabulary learning, they were administered unannounced. The tests included a checklist, L2 meaning production test, L1 meaning production test, and a bilingual synonym match test (see Appendix D). In all tests, each correct answer was scored as 1 and incomplete or wrong answers as 0.

The checklist was a form recognition test in which there were twenty-five target words and twenty-nine nontarget words as distractors. The participants were asked to choose which words they remember from the story. A reliability check was done and the inter-rater reliability coefficient of .871 (Cronbach Alpha) was obtained. The L2 meaning production test was administered after the checklist. The target words were listed in L1 and students were asked to write down the L2 equivalent of the target words. The inter-rater reliability coefficient turned out to be .789. The third test was L1 meaning production test which required students to write an L1 translation of 25 target words in L2 with their grammatical forms. The inter-rater reliability coefficient was .807. The fourth test was a bilingual synonym match test in which the students were given definitions of the target words in Turkish and were asked to match them with the words in question. The inter-rater reliability coefficient of .667 was obtained.

Procedure

The data collection instruments were piloted with 15 students with similar language proficiency. There were three students for each condition. The entire process of treatment was tested and the researcher revisited some of the instructions and distractors

in the bilingual synonym match test. Time slot was given as 60 minutes per condition but then as the students in the piloting group needed extra time, the time slot for each condition was extended. The instruments were ready to administer it to the actual participants.

Two weeks before the experiment, the participants were assigned to take part in a mobile-assisted listening activity at a certain date and time (five different time slots for each condition) in two classes. At the beginning of the treatment, they were given the instructions about the processes of the study. The procedure was established as follows: listen to the text (twice if they would like), then do the free recall task and vocabulary tests. The whole process consisted of both online and offline data collection. The online part was collected with a Samsung Galaxy Mini mobile device and an earphone. Students were requested to use the earphone to minimize the distraction of each other's listening. Two routers were placed in the classes, they were able to connect the internet and run the listening application. Before they started, the screen casts of the condition with a different listening text and glosses was shown to the participants as a sample so that they could have a better understanding of what they were going to be exposed to through the application. Then, the participants started the listening task. At the same time, all the physical movements of the participants based on their taps on the screen were recorded to the online database as they listened to the text. The offline data collection was done through paper-based activities following the listening text. When the students finished listening and were ready to engage in the related activities, the researcher distributed the free recall task paper and the tests in sequence. An assistant was recruited to proctor the participants when they were doing the activities. Meanwhile

the researcher prepared the other class to start the same procedure for the subsequent condition. The span of time allotted to the procedure was approximately 80 minutes per condition.

Data Analysis

Quantitative methods of data analysis were used in the current study. Before inferential analyses were conducted, the descriptive statistics of the test scores were obtained and the distributions were examined for normality. The outliers in each condition were eliminated and the sample size for each condition became 21 after the initial examination of the data. The normality and homogeneity of variance assumptions of ANOVA were sustained. One-way analyses of variance (ANOVA) and planned orthogonal contrasts were conducted on the free recall task and vocabulary test scores in order to determine the effect of access to glosses, type of glosses, and self-regulation on listening comprehension and incidental vocabulary learning. As for the analysis of the data regarding the listening strategies and gloss use strategies, frequencies were calculated and a 2 (time: first listening vs. second listening) X 3 (gloss conditions: textual-only, pictorial-only, textual-plus-pictorial) mixed ANOVA was conducted to determine any group differences in the access of glosses. Moreover, a 2 (time: first listening vs. second listening) X 5 (all conditions: no-gloss-self-regulation, no-gloss-no-self-regulation textual-only, pictorial-only, textual-plus-pictorial) mixed ANOVA was conducted to examine any group differences in time spent on listening. Post-hoc comparisons were carried out by using the Bonferroni procedure with alpha level .01.

CHAPTER 6

RESULTS

This chapter presents the results of data analysis and initial interpretations to answer the research questions mentioned in Chapter 5. It includes the results of descriptive data as regards the effects of glosses and self- regulation on listening comprehension and incidental vocabulary, listening strategies and gloss use strategies, frequency of access to glosses, and duration of listening. The results of the inferential statistical analyses are also presented.

Effects of Glosses and Self-regulation on Listening Comprehension

Descriptive statistics for recall scores across five conditions are provided in Table 1. The participants in the textual-plus-pictorial condition scored highest on the recall task followed by textual-only gloss, no-gloss-self-regulation, pictorial-only and no-gloss-no-self-regulation conditions. Interestingly, the participants in the no-gloss-no-self-regulation condition scored slightly higher than those in the pictorial-only gloss condition, and the participants in the textual-only gloss condition scored similarly as the participants in the textual-plus-pictorial gloss condition did. A one-way between subjects ANOVA revealed that the differences among the group means were not statistically significant, [$F(4, 105) = 1.96$, $p > .05$].

Table 1.

Descriptive Statistics for Recall Scores Across the Five Conditions

	M	SD	SE	Min.	Max.
Textual + pictorial gloss	15.00	8.94	1.91	3	35
Pictorial-only gloss	10.18	6.65	1.42	2	25
Textual-only gloss	14.77	10.95	2.34	2	42
No-gloss-self-regulation	12.32	7.73	1.65	2	31
No-gloss-no-self-regulation	9.50	7.46	1.59	2	26

In addition to one-way ANOVA, orthogonal planned contrasts that provide more power to the analysis were conducted (Huck, 2000). The first contrast pointed to a nonsignificant difference between the combined mean of no gloss conditions and the combined mean of gloss conditions, [$t_{105} = 1.46$, $p > .05$]. The second contrast that compared the means of the two conditions with no gloss revealed that self-regulation while listening did not make a difference in terms of comprehension, [$t_{105} = 1.10$, $p > .05$]. The third contrast that compared the combined mean of textual-only and pictorial-only groups to the mean of textual-plus-pictorial gloss group revealed a nonsignificant result, [$t_{105} = 1.14$, $p > .05$]. Finally, the fourth contrast that compared the mean of the textual-only group to that of the pictorial-only group yielded a nonsignificant finding [$t_{105} = 1.80$, $p > .05$]. Thus, the contrasts confirmed the ANOVA results suggesting that access to glosses and self-regulation during listening do not affect recall of information in L2 listening.

Effects of Glosses and Self-regulation on Incidental Vocabulary Learning

Table 2 provides the descriptive statistics for the vocabulary tests across the five conditions. The lowest means observed in all tests belonged to the conditions where no

glosses were provided. In other words, the gloss conditions had higher means than the no-gloss conditions. Additionally, the means of the three gloss conditions on all tests were only slightly different.

Table 2.

Descriptive Statistics for Vocabulary Tests Across the Five Conditions

	Mean	SD	SE	Min.	Max.
Form recognition					
Textual-plus-pictorial gloss	16.36	5.57	1.19	5	25
Pictorial-only gloss	17.59	4.80	1.02	6	25
Textual-only gloss	18.36	4.04	0.86	11	25
No–gloss-self-regulation	8.82	3.35	0.71	4	15
No-gloss-no-self-regulation	10.55	3.25	0.69	4	18
L2 meaning production					
Textual-plus-pictorial gloss	13.41	4.84	1.03	5	24
Pictorial-only gloss	11.50	3.50	0.75	6	19
Textual-only gloss	13.86	4.22	0.90	6	21
No-gloss-self-regulation	10.18	4.03	0.86	4	17
No-gloss-no-self-regulation	10.77	3.98	0.85	3	19
L1 meaning production					
Textual-plus-pictorial gloss	17.00	5.53	1.18	9	25
Pictorial-only gloss	15.00	3.37	0.72	10	21
Textual-only gloss	17.09	3.73	0.80	10	24
No-gloss-self-regulation	12.77	4.09	0.87	6	19
No-gloss-no-self-regulation	14.50	3.99	0.85	6	22
Bilingual synonym match					
Textual-plus-pictorial gloss	24.14	1.21	0.26	21	25
Pictorial-only gloss	24.59	0.60	0.13	23	25
Textual-only gloss	24.18	1.01	0.22	22	25
No-gloss-self-regulation	23.14	2.66	0.57	14	25
No-gloss-no-self-regulation	23.86	1.55	0.33	20	25

In order to determine whether there were significant differences among the means, a one-way ANOVA was conducted on each of the test scores. The ANOVA results showed that there were significant differences among the group means on all tests,

namely form recognition [$F(4, 105) = 22.61$, $p < .01$], $\eta^2 = 0.46$; L2 meaning production [$F(4, 105) = 3.38$, $p < .01$], $\eta^2 = 0.11$; L1 meaning production [$F(4, 105) = 4.11$, $p < .01$], $\eta^2 = 0.13$, and bilingual synonym match [$F(4, 105) = 2.60$, $p < .05$], $\eta^2 = 0.09$.

As for the planned orthogonal contrasts for the vocabulary tests, the first contrast indicated that there was a significant difference between the combined mean of no gloss conditions and the combined mean of gloss conditions for form recognition [$t_{105} = 9.28$, $p < .01$], L2 meaning production [$t_{105} = 3.04$, $p < .01$], L1 meaning production [$t_{105} = 3.33$, $p < .01$], and bilingual synonym match [$t_{105} = 2.63$, $p < .05$].

The second contrast that compared the means of the two conditions with no glosses revealed nonsignificant differences for form recognition [$t_{105} = 1.34$, $p > .05$], L2 meaning production [$t_{105} = .47$, $p > .05$], L1 meaning production [$t_{105} = 1.36$, $p > .05$], and bilingual synonym match [$t_{105} = 1.54$, $p > .05$].

The third contrast comparing the combined mean of textual-only and pictorial-only groups to the mean of the textual-plus-pictorial gloss group revealed a nonsignificant result for form recognition [$t_{105} = 1.44$, $p > .05$], L2 meaning production [$t_{105} = .67$, $p > .05$], L1 meaning production [$t_{105} = .87$, $p > .05$] and bilingual synonym match [$t_{105} = .61$, $p > .05$].

The last contrast that compared the mean of textual-only group to that of the pictorial-only group yielded a nonsignificant finding for form recognition [$t_{105} = .60$, $p > .05$], L2 meaning production [$t_{105} = 1.90$, $p > .05$], L1 meaning production [$t_{105} = 1.65$, $p > .05$], and bilingual synonym match [$t_{105} = .87$, $p > .05$].

These results suggest that access to glosses facilitates recognition and production of target words in the L2, whereas the type of gloss does not have a significant role. In

addition, the findings indicate that self-regulation during listening does not have an impact on incidental vocabulary learning.

To summarize, the results of one-way ANOVAs and orthogonal planned contrasts indicate that access to glosses had no effect on L2 listening comprehension whereas it did facilitate incidental vocabulary learning in the L2. However, the type of gloss did not make any difference in terms of incidental vocabulary learning in the L2. Additionally, self-regulation during listening did not impact either comprehension or incidental vocabulary learning.

These findings partially confirm the first hypothesis that predicted facilitative effects of access to glosses both for text recall and incidental vocabulary learning. While the hypothesis was confirmed for incidental vocabulary learning it was confirmed for text recall. Additionally, Hypothesis 2 that predicted superiority of dual-modality glosses over those of single-modality was not confirmed. Finally, Hypothesis 3 which predicted that self-regulation facilitates text recall and incidental vocabulary learning was not confirmed.

The Use of Strategies During Listening

In order to determine the strategies used by the participants as they listened to the story, each physical touch of participant on the screen was recorded and kept as log files. These log files provided information about how the participants interacted with the system as they listened. The logs were examined under two categories: listening strategies and gloss use strategies.

Listening Strategies

The categorization of listening strategies was based on Roussel (2011) who identified global and analytical listening as two main listening strategies. Global listening strategy refers to listening to a text from the beginning to the end without any interruptions. Analytical listening strategy, on the other hand, involves listening to the text with more than one or two interruptions (Roussel, 2011, pp.107-108). Another strategy emerged from the data in the present study, namely segmented listening, which involves several truncated listening sessions where the student does not listen to the end of the text. When using the segmented listening strategy, the listener pauses the audio file without listening to the end of the track and then goes back and forth, making it hard to determine when the second listening starts. Since the participants were allowed to listen to the story twice, these strategies were examined both for the first and second listening. Table 3 illustrates the number of participants opting for one of the three listening strategies.

Table 3.

Frequency of Listening Strategies

	Textual + Pictorial		Pictorial-only		Textual-only		No-gloss-self-regulation	
	N	%	N	%	N	%	N	%
1st Listening								
Global	6	27.3	4	18.2	8	36.4	10	45.8
Analytical	11	50	12	54.5	12	54.5	10	45.8
Segmented	5	22.7	6	27.3	2	9.1	2	9.1
2nd Listening								
Global	2	9.1	5	22.7	3	13.6	2	9.1
Analytical	15	68.2	11	50	13	59.1	17	77.3
No listening	5	22.7	6	27.3	6	27.3	3	13.6

Of the two no-gloss conditions, no-gloss-no-self-regulation condition was not examined as the participants were not provided with a control panel to regulate their listening; the only control they had was to do with starting and ending the track. Thus, all the participants in the no-gloss-no-self-regulation condition (n=22) were forced to employ a global listening strategy as they were given no control.

As seen in Table 3, in the first listening, segmented listening strategy did not seem to be a preferred strategy. While there were an equal number of participants who preferred the global or analytical strategy when no glosses were provided, a greater number (almost half) of the participants seemed to prefer analytical listening when glosses were provided. In the second listening, the participants opted for the analytical strategy in all listening conditions. Especially striking was the increased number of the participants (77%) who employed this strategy in the no gloss condition. Overall, we can say that in all conditions, analytical listening strategy was more preferred than global listening strategy, suggesting that the participants listened to the story with some interruptions. In general, the participants tended to listen analytically in the gloss conditions during both the first and second listening, while those in the no gloss condition had an equal tendency for either global or analytical listening strategy during the first listening but they primarily preferred listening analytically during the second listening.

Gloss Use Strategies

Table 4 shows the type and frequency of gloss use strategies across the three gloss conditions. In Table 4, “none” indicates no glosses were looked up while listening,

"simultaneous gloss" indicates that the participants looked up glosses as they listened to the story. "Successive" refers to pausing the story and then checking the meaning of the gloss while "mixed" means looking up the glosses both simultaneously and successively.

During the first listening, the majority of the participants preferred to use glosses as they were listened to the text (i.e., simultaneously) in all gloss conditions. During the second listening, the majority of the participants still used glosses simultaneously. However, a significant number of participants did not look up any gloss at all during the second listening. Successive gloss use, which is looking up glosses after pausing the story, does not seem to be a preferred strategy.

Table 4.

Frequency of Gloss Use Strategies

	Textual + Pictorial		Pictorial		Textual	
	N	%	N	%	N	%
1st Listening						
None	-	-	-	-	1	4.5
Simultaneous	11	50	12	54.5	15	68.2
Successive	1	4.5	2	9.1	1	4.5
Mixed	10	45.5	8	36.4	5	22.7
2nd Listening						
None	5	22.7	8	36.4	7	31.8
Simultaneous	12	54.5	11	40.9	10	45.5
Successive	-	-	-	-	1	4.5
Mixed	6	22.7	5	22.7	4	18.2

Frequency of Access to Glosses

Table 5 illustrates the frequency of glosses accessed across the three conditions. It should be noted that there were 43 glossed words in total. If the participants clicked on a particular gloss more than once, each click was counted.

Table 5.

Frequency of Access to Glosses

	Textual + Pictorial	Pictorial	Textual
1st Listening			
Mean	45.95	51.77	37.73
SD	38.63	29.16	28.88
Min.	4	5	2
Max.	136	104	102
2nd Listening			
Mean	20.95	27.82	14.91
SD	33.61	32.18	19.52
Min.	0	0	0
Max.	151	99	58

Table 5 indicates that the participants used glosses more frequently during the first listening than the second listening. In addition, the participants in the pictorial-only condition used the glosses more frequently than those in the other conditions both during the first and second listening. The least number of glosses was used by the participants in the textual-only condition during both first and second listening. In all the conditions, there were some participants who did not prefer to look up glosses during the second listening.

A 2 (time: first listening vs. second listening) X 3 (gloss condition: textual-only, pictorial-only, textual-plus-pictorial) mixed ANOVA was conducted to determine whether there were significant differences among the groups in terms of access to

glosses. The results revealed that the main effect for time was significant, $F(1,63) = 23.52$, $p < .001$, partial eta$^2 = .27$. However, the main effect of gloss condition, $F(2,63) = 1.81$, $p > .05$ and the interaction between time and gloss condition were nonsignificant, $F(2,63) = .02$, $p > .05$. These findings suggest that the participants accessed significantly more glosses during first listening compared to second listening. Gloss condition, however, did not have an effect on the frequency of access to glosses.

Pearson product-moment correlations were examined in each gloss condition to determine whether the frequency of access to glosses was significantly related to text recall and vocabulary learning. The only significant correlation observed was between the number of glosses accessed during first listening and the number of target words recognized in the textual-only condition ($r = .50$).

Duration of Listening

Descriptive statistics of listening duration across the conditions are displayed in Table 6.

Table 6.

Listening Duration across the Conditions

	Textual + Pictorial	Pictorial-only	Textual-only	No-gloss-self-regulation	No-gloss-no-self-regulation
1st Listening					
Mean	00:19:02	00:20:42	00:16:52	00:18:49	14:53
SD	00:06:35	00:06:59	00:04:46	00:05:41	00:35
Min.	00:10:24	00:12:56	00:10:39	00:13:53	13:49
Max.	00:35:05	00:35:44	00:30:29	00:33:50	15:43
2nd Listening					
Mean	00:11:32	00:10:50	00:09:28	00:11:33	13:05
SD	00:06:58	00:07:16	00:06:35	00:06:05	02:59
Min.	00:00:00	00:00:00	00:00:00	00:00:00	00:00
Max.	00:19:10	00:19:48	00:18:04	00:18:44	14:14

As seen from Table 6 above, the pictorial-only condition had the highest mean in the first listening followed by textual-plus-pictorial, no-gloss-no-self-regulation, textual-only condition and no-gloss-no-self-regulation. No-gloss-no-self-regulation condition had the highest mean in the second listening followed by no-gloss-self-regulation, textual-plus-pictorial, pictorial-only and textual-only gloss conditions. The second listening was optional in all conditions.

A 2 (time: first listening, second listening) X 5 (condition: no-gloss-no-self-regulation, textual-only, no-gloss-self-regulation, pictorial-only, textual-plus-pictorial) mixed ANOVA was conducted to determine whether there were significant differences among the groups in terms of the amount of time spent on the listening task. The results revealed significant main effects for time and condition, but a nonsignificant interaction between time and condition, $F(4,105) = .1.73$, $p > .05$. The main effect for time, $F(1,105) = 44.69$, $p < .001$, partial $eta^2 = .30$ suggests that significantly less time was spent on the task during the second listening. The main effect of condition, $F(4,105) = 4.41$, $p < .01$, partial $eta^2 = .14$ was probed through post-hoc comparisons using the Bonferroni procedure. These comparisons revealed that the participants in the textual-only gloss condition spent significantly less time on the task compared to the pictorial-only and textual-plus-pictorial gloss conditions. The comparison of the textual-only condition to the no gloss conditions with self-regulation and no self-regulation were nonsignificant. All the other comparisons were nonsignificant. In other words, the participants spent the longest time on the task in the pictorial-only and textual-plus-pictorial gloss conditions.

Pearson product-moment correlations of time spent on task with recall and vocabulary scores revealed a substantial negative correlation between the number of target words recognized and the duration of fist listening (r = -.51) in the pictorial-only gloss condition. Other correlations were not significant.

CHAPTER 7

DISCUSSION

The purpose of this chapter is to discuss the research findings in relation to previous studies, and, based on the findings, to reflect on the current state of mobile-assisted language learning as regards L2 listening comprehension and incidental vocabulary learning. The current investigation has addressed the concept of MALL with its design issues and expanded upon previous gloss studies by assessing the effect of multimedia glosses in helping learners with L2 text comprehension and incidental vocabulary learning, and by exploring the gloss use and listening comprehension strategies utilized in a MALL environment.

The results suggest that glosses have a significant facilitative effect on incidental vocabulary learning while their effect on listening comprehension was found to be nonsignificant. Moreover, access to glosses boosts recognition and production of target words in L2 irrespective of the type of glosses. The findings also show that self-regulation during listening does not impact either listening comprehension or incidental vocabulary learning. As for the strategies employed, analytical listening strategies are preferred over global listening strategies in gloss conditions, whereas in the no-gloss condition, listeners do not opt for a specific strategy but employ both types of strategies equally. In terms of gloss use strategies, simultaneous gloss use is preferred more frequently, with gloss type having no effect on the type of strategy used and the frequency with which glosses are accessed. It was also observed that the participants exploited glosses to a greater extent in the first listening compared to the second

listening in that they accessed glosses more frequently and spent longer time utilizing them.

The nonsignificant effect of glosses on listening comprehension contrasts with the findings of other studies that demonstrated beneficial effects of multimedia glosses both on reading comprehension (e.g., Chun, 2001; Chun & Plass, 1996a, 1996b; De Ridder, 2002; Leffa, 1992; Lomicka, 1998; Plass, Chun, Mayer, & Leutner, 1998; Taylor, 2006; Yanguas, 2009) and listening comprehension (e.g., Jones, 2004, 2006; Jones & Plass, 2002; Plass & Jones, 2005). On the other hand, the findings concur with a number of studies that found no significant effects of glosses on text recall after reading (Ariew & Erçetin, 2004; Gasigijtamrong, 2013; Jacobs et al., 1994; Joyce, 1997; Zarei & Mahmoodzadeh, 2014) or listening (Cottam, 2010; Cottam & Savenye, 2008).

The inconsistency regarding the effects of multimedia glosses on text comprehension can be attributed to factors such as the type of task used to measure text comprehension or the proficiency level of the learners. The task used in the current study was text recall, which elicits main ideas or salient information in the text and heavily relies on the reader's memory. Such a task may fail to discriminate different levels of text processing such as making inferences (Chang, 2006, p. 537). A case in point is the study by Türk and Erçetin (2014) who have demonstrated significant positive effects of simultaneous presentation of verbal and visual glosses on reading comprehension measured through a multiple-choice test while no such effect was observed with a recall task.

Several studies have pointed to the significant role of language proficiency level in mediating the effects of glosses. For instance, Ariew and Erçetin (2004) have shown

that advanced learners of English did not make extensive use of multimedia annotations during reading and their comprehension was not affected by access to glosses, whereas the intermediate learners used glosses extensively, with visual annotations (videos or static images) having a negative effect on their text comprehension. The negative effect of visual annotations on low-proficiency learners' comprehension was also confirmed by Şakar and Erçetin (2005). As Hu, Vongpumivitch, Chang, and Liou (2014) argue, the conceptual link between glosses and unknown target words in multimedia mode is difficult for students with low-level proficiency to grasp. It might be even more challenging for low proficiency learners to "pick up" meaning incidentally when the given text lacks a continuous flow due to glossing. Moreover, it is known that successful comprehension requires interaction between top-down and bottom-up cognitive processes, learners need to use word-level definitional glosses along with top-down strategies like using background knowledge information and contextual information to fully comprehend a text. Considering that learners in the present study were lower-intermediate or intermediate level learners, their extensive reliance on word level glosses may have hindered their use of higher-order comprehension processes.

Another confounding factor regarding the effects of multimedia glosses on text comprehension might be related to the low frequency of word occurrence. Studies found a correlation between frequency of exposure and acquisition of the unknown words (Horst, Cobb, & Meara, 1998). Van Zeeland and Schmitt (2013) claim that the minimum number of occurrences differs across the studies, for example Horst et al. (1998). set a minimum number of occurrences (15 times per word) for better recall and text comprehension (van Zeeland & Schmitt 2013). In the present study, the maximum

frequency of words illustrated was far below that minimum threshold (For example, corn (5 occurrences) and farm (4 occurrences). Given that most of the target words were not frequently and selectively repeated in the text (see Appendix E), learners' attention might have not been sufficiently directed to the frequently repeated words thus failing to facilitate L2 listening comprehension and vocabulary learning (Rott, 2007).

Finally, the mobile environment itself may be a factor in failing to observe facilitative effects of multimedia glosses on text recall. The novelty of the mobile-oriented instructional method might be a challenge for MALL studies. Given the relative novelty of MALL, the students might not have acclimated to this new method of L2 listening with gloss lookups available simultaneously or in a very short span of time. (Zarei & Mahmoodzadeh, 2014). Additionally, some physical limitations related to screen size might have been problematic for the effective implementation of MALL (Stockwell, 2008; Stockwell & Hubbard, 2013). The findings regarding incidental vocabulary learning, on the other hand, are congruent with a number studies which showed the significant positive effects of glosses on incidental vocabulary learning either as a by-product of reading (e.g. Chun & Plass, 1996a, 1996b; Plass, Chun, Mayer, & Leutner, 1998; Yanguas, 2009; Yoshii & Flaitz, 2002) or listening (Jones, 2004; Jones & Plass, 2002). The majority of the aforementioned studies (e.g., Al-Seghayer, 2001; Chun & Plass, 1996a, 1996b; Kost et al., 1999; Plass et al., 1998) found positive correlations in favor of dual modality glosses (i.e., visual-plus- textual) over the use of single modality glosses (i.e., textual-only or pictorial-only). The superiority of dual modality glosses can be explained by DCT, which postulates that human cognition is equipped with structurally and functionally "separate subsystems, one specialized for

the representation and processing of information concerning nonverbal objects and events, the other specialized for dealing with language" (Paivio, 1986, p. 53). Based on this assumption of DCT, CTML proposed the multimedia principle, which suggests that active meaningful learning can better be facilitated through words and pictures than from the use of words or pictures alone (Mayer, 1997, 2001).

Contrary to DCT, CTML, and previous studies supporting the assumptions of these theories, the findings of the current study suggest that the type of gloss does not matter in terms of facilitating incidental vocabulary learning. A similar finding was obtained by Yanguas (2009) who investigated the effects of textual-only, pictorial-only and textual-plus-pictorial glosses on reading comprehension and incidental vocabulary learning. The qualitative data collected through think-aloud protocols revealed that learners exposed to all three gloss conditions noticed and recognized significantly more of the target words than the control group, which was exposed to only the reading text without glosses. Bowles (2004) also found that both multimedia glosses and traditional glosses caused learners to notice target words. Yanguas (2009) and Bowles (2004) explain their findings through the noticing hypothesis proposed by Schmidt (1990). The noticing hypothesis posits that attention and noticing are necessary correlates for input to become intake (Schmidt, 2001). Considering that glosses draw learners' attention to the meaning of unknown words during the reading or listening process, the learner's focus is not solely focused on text comprehension, albeit the primary focus of the task being comprehension. In a similar vein, Plass and Jones (2005), in their theoretical account of second language acquisition with multimedia, argue that interaction with the text by means of information links that provide simplification, elaboration, or

definitional support can facilitate apperception of input, that is selection of verbal and pictorial information to be represented in a text base or image base. Thus, both verbal and visual glosses draw attention to linguistic information, which is essential for noticing.

Another major finding of this study is that self-regulation during listening does not impact either listening comprehension or incidental vocabulary learning. Despite theoretical discussions arguing that learner control in multimedia learning environments increases interest and motivation in learners (e.g., Alexander & Jetton, 2003; Deimann & Keller, 2006), accommodates learner needs and learning styles (e.g., Deimann & Keller, 2006; Plass & Jones, 2005; Plass et al., 1998; Scheiter & Gerjets, 2007), and complements learners' information processing and text comprehension (Roussel, 2011; Zhao, 1997), empirical evidence for these arguments is inconclusive (e.g., Dillon & Gabbard, 1998; Lunts, 2002; Türk & Erçetin, 2014). The findings of the current study do not provide any evidence in favor of learner control. Specifically, the participants who were allowed to regulate their listening did not have significantly higher means than those who were not allowed self-regulation during listening in terms of text comprehension and vocabulary learning. This result is surprising since a distinctive feature of mobile devices is to provide learners with self-control over the input (Fuente, 2014). Such control is supposed to support learners in noticing and directing their attention towards a certain form and, in turn, facilitate learning in a range of contexts (Kukulska-Hulme & Bull, 2009). Fuente (2014) compared the effects of two mediums for delivery of listening text (learner-controlled mobile-assisted language learning/MALL vs. instructed-manipulated language learning/IMLL) on learners'

noticing and type of processing (top-down vs. bottom-up). Fuente (2014) hypothesized that MALL instructional technology was more effective for attention-focusing than instructor-facilitated instruction, therefore, MALL settings would promote both higher levels of top-down (overall) and bottom-up (target structures and forms) processing, enhancing noticing and improving overall comprehension. The hypotheses were confirmed with the findings of the study, which indicate that learners in the MALL group showed significantly higher levels of noticing of target forms, bottom-up comprehension and overall meaning comprehension. Fuente (2014) reported the superiority of MALL to promote both noticing and comprehension in the aural mode over instructed-manipulated language learning. She indicates self-regulation of (giving learners control over) L2 listening texts using a mobile device (iPods) for selective attention purposes helps the process of noticing, thus, promoting comprehension. Roussel (2011) also speculated that giving learners an opportunity to have control (self-regulation) over input improves the participants' information processing and "allows them to better handle incoming aural discourse" (p. 114). However, the findings of her study indicated that self-regulation did not enhance low proficiency learners' performance and so the degree to which self-regulating strategies improves listening performance of learners may depend on the learner's level of language proficiency. That is, regardless of whether or not learners are provided with flexibility to regulate their listening, their level of proficiency has a greater effect on comprehension. The findings of the present study are consistent with Roussel (2011) as this study has found that self-regulation during listening does not impact either listening comprehension or incidental vocabulary learning with low proficency learners.

As for the strategies used, the findings indicate that an analytical listening strategy is preferred over global listening when glosses are provided during listening. This may suggest that learners processed the text in small units and might have taken more time to construct meaning when input modification was provided. Given the participants' low level of proficiency, such a finding is not surprising. One wonders whether the use of analytical listening strategy might have caused reliance on bottom-up processes and hindered smooth text comprehension. Ko (2005) argues to the contrary such that glosses facilitate high-level strategies and facilitate smoother and faster reading. Considering the findings of the current study pointing to a nonsignificant difference between the experimental conditions in which the learners could regulate their listening and the condition in which they did not have such a control, it is not possible to argue that analytical listening strategy might have hindered smooth text comprehension. As for the gloss use strategy, simultaneous gloss use was preferred in all gloss conditions. In other words, the participants used the glosses as they listened to the text. This suggests that they tried to keep up with the flow of continuous text while they made use of input modification.

The frequency of access to glosses did not differ significantly across the gloss conditions although time on task did. The participants in the textual-only condition spent significantly less time on task during first listening. Morever, there was a substantial positive relationship between frequency of access to glosses and the number of target words recognized in this condition. This may suggest that the direct relationship between the definition provided by glosses and the target word might have facilitated the use of more efficient strategies. On the other hand, the participants in the pictorial

only and textual-plus-pictorial gloss conditions spent significantly longer time on task compared to the textual-only condition. Considering the substantial negative relationship between time on task during first listening and the number of target words recognized in the pictorial-only gloss condition, it is possible that pictorial glosses have a distracting effect unless they directly convey the meaning of words as in concrete nouns.

CHAPTER 8

CONCLUSION

The current study presents an empirical study of the effectiveness of multimedia glosses and strategy use on second language listening comprehension and incidental vocabulary learning in a mobile environment. After developing multimedia glosses and setting up a mobile environment in which to deliver L2 aural text, the participants were randomly assigned to five gloss groups: three types of glosses (textual-only, pictorial-only and textual-plus-pictorial) and two no-gloss groups (no-gloss-no-self-regulation, and no-gloss-self-regulation). Based on the user tracking data embedded in the database, recall protocol and vocabulary tests, it was found that access to glosses and self-regulation during listening do not affect recall of information in L2 listening. One important finding is that access to glosses facilitates recognition and production of vocabulary, which is consistent with the findings of the previous studies; however, type of gloss has no significant role in that. The results also indicate that when glosses are available, analytical listening strategies are more prevalent than global listening strategies and students might have some difficulty to listen to the text smoothly. When there is no gloss available, students showed an equal tendency for either analytical or global listening. As for the access to glosses, glosses are more frequently used when they are encountered in the first listening. Although learners had access to glosses in the second listening as well, they often forego referencing them and the duration of second listening is usually shorter. Lastly, participants in gloss groups with visuals spend more time on the task than students in the textual-only gloss groups.

Implications

Findings of this study have implications for the provision and design of multimedia presentations for L2 listening and incidental vocabulary learning. In discussing the effects of multimedia glosses pedagogically, Taylor (2009) suggests that glosses should be appropriately tailored for the proficiency level of students. For example, if glosses are too easy for a student, they can be ineffective for improving reading comprehension (Cheng & Good, 2009). Yun's (2011) meta-analysis of glosses on L2 vocabulary acquisition highlights that low proficiency learners are more likely to make use of glosses than other proficiency level students. That's because the degree of benefit from glosses depends on the level of text difficulty and as the text difficulty arises, the reader's utilization of gloss also increases (O'Donnell, 2009, 2013). However, the converse might be possible, too. But generally if readers are unable to grasp the basics in a text, then they might skip to or focus on additional salient resources such as glosses.

Another issue is how to determine the words to be glossed. The target words selected to be glossed should be chosen based on a thorough search of the words in comprehensive frequency corpora and their importance and usefulness in the text rather than intuitive sense or personal judgment. It is stressed that designers and instructors should be careful in selecting keywords to be glossed (Al-Seghayer, 2003). These words should be necessary for text comprehension and words that are frequent, useful and important to the text. The use of frequency corpora is recommended to check how frequently a word in used in a variety of context (Al-Seghayer, 2003; Hong, 2010). However, it should be noted that some words might be frequently used whereas others are used in specific contexts; therefore, the context of word use should be also checked.

Apart from checking the word frequency on corpora, another less systematic method is to have some representative students randomly select words to be glossed from a targeted word bank. Students can also be asked to mark or tap the unknown words. This can be used to establish preexisting knowledge of vocabulary crucial to comprehend the text in a mobile learning environment.

In addition to pedagogical concerns, technical concerns should also be mentioned as regards to the effectiveness of glosses. Al-Seghayer (2003) suggests the use of software-embedded user-behavior (user-action) tracking system in order to explore learner's look-up behaviors and its relation with his/her own learning process and the output (gains) in learning vocabulary. From a more general perspective, Fischer (2007) points out that it is essential to monitor students' look-up behavior in CALL environment and to discover what students are actually doing for their own learning. This practice is regarded as a form of "ethnographic research" in the CALL community (p. 411). The use of tracking systems has been practiced and highlighted by researchers for different reasons: identifying problems for follow-up learning activities (Colpaert, 2004), investigating students' participation in computer-assisted communication (Chun, 1994), promoting learner autonomy in a CALL setting (Fischer, 2007; Reinders & Hubbard, 2013), making precise evaluation of student participation in learning (Fischer, 2007) and investigating students' interaction patterns with specific software components (Chapelle, 2001; Pujolà, 2002). In multimedia gloss studies, data tracking can be utilized for collecting data about what learners do when they engage in the learning task. The learners' learning processes becomes more observable and explicit.

Limitations

The present study suffers from a couple of limitations. One of the fundamental limitations was the controlled experiment of L2 listening and incidental vocabulary learning in a mobile environment. Mobile environment refers to flexibility to access the material without any time and space boundaries; however, in this research the ideal MALL setting was not set up due to the true experimental study design. Additionally the researcher utilized mobile phones, which had reduced screen size and low screen resolution. This was especially important for the gloss groups as they were exposed to images and text in small size and resolution. Another limitation was the nature of glossed words that were abstract and related to feelings. It was challenging to ensure that the students could easily predict the meaning from the pictures in pictorial-only or textual-plus-pictorial glosses. The assessment type was another limitation. There was only immediate testing used in this study. Delayed tests for listening comprehension and vocabulary learning were not administered in the study. Lastly, the use of convenience sampling in this study limits its representativeness of the population and the generalizability of the results.

Future Research

Three critical issues remain unexplored due to certain limitations: students' individual differences, the corresponding modalities between gloss type and tests, and the effect of working memory capacity on incidental vocabulary learning. Firstly, in the present study, students' individual differences as verbalizers and visualizers have not been investigated in relation to their effects on the efficacy of glosses and strategy use for L2

listening comprehension and incidental vocabulary learning. The differences between high and low spatial and verbal ability students seem to affect their comprehension and vocabulary learning (Chun & Plass, 1996a, 1996b; Plass, Chun, Mayer, & Leutner, 2003). As verbal and spatial abilities are two cognitive features that help students to process information, build referential connections between input and construct meaning it seems likely that inherent cognitive strengths would dictate gloss type preference. It is discussed that high-spatial students are more likely to make use of pictorial information due to smooth and effortless processing of information presented through pictures, whereas low-spatial-ability students need to expend a considerable amount of cognitive effort to process that type of information (Riding & Cheema, 1991). It is likewise likely true for high-verbal-ability students versus low-verbal-ability students with respect to textual glosses. This research issue is worthy of investigating to gain a better understanding of gloss effect on L2 listening and vocabulary learning. The students' individual differences can explain the effectiveness or ineffectiveness of specific gloss use in L2 text comprehension and incidental vocabulary learning.

Secondly, the design of vocabulary assessment could be in line with the treatment modalities. For example, students exposed to pictorial-only glosses might take vocabulary tests prepared not in texts but in pictures. They could then make a smooth and fast reference to what they have been exposed to and what they need to retain for the vocabulary test. Their performance might be much better than their performance in a text-based test.

Thirdly, the role of working memory capacity in mediating the effects multimedia glosses and self-regulation should be taken into account. This would allow analyzing the cognitive load imposed by the treatment by conditions in greater depth.

These three issues for future work will increase our understanding of how individual differences, testing modality and working memory mediate the effects of glosses.

APPENDIX A

LISTENING TEXT

Now the Special English program American Stories.

Our story today is called Judge. It was written by Walter D. Edmonds. We will hear part one of the story today and part two next week. Here is Harry Monroe with our story.

When Charlie Hestle died, he left a wife and nine children. They lived on a small piece of land in a house with four rooms. John was the oldest boy. He was 16 years old and tall for his age. After his father died, John's mother told him, he would have to take care of the family. So John went into the cornfield behind the small house. There was very little corn and very many weeds. His family needed corn and corn needed room to grow. John bent down and began pulling out the weeds.

When John came in for supper that night, he told his mother that he had cleaned half the cornfield. She was surprised and immediately went outside to look at what he had done. While she was looking at the field, she remembered that her husband had sold some corn to Judge Don. She also remembered that they had never collected the money for the corn. She told John to go to the judge's house right away to get it. John was afraid of Judge Don. The judge was the richest man in town. He owned a lot of land and everyone owed him money. His stone house looked like a palace.

John went to the judge's house and knocked on the door. A servant opened it right away and brought John into the judge's office.

Judge Don was sitting at his desk. He was a very big man with a red face, long white hair and serious blue eyes. John stood with his back to the door. He held his hat in both hands.

"Hello, John," said the judge, "What do you want?"

John told the judge about the money.

"Oh, yes" said the judge, "I had forgotten about that. I'm sorry." He stood up and reached into his pocket. Slowly he pulled out a large brown leather wallet. He opened it and took out a new dollar bill and handed it to John. Then he sat down at his desk again.

"How are you and your family doing?" He asked.

"All right, sir." John said. "I wouldn't have bothered you about this money, but we needed it."

"That is all right," the judge said slowly, "I should have remembered it. I didn't think of it. Because your father owed me money. He owed me forty dollars."

John was so shocked he couldn't think of anything to say. Forty dollars was a fortune for him and his family. The judge looked at John for a few moments. "How old are you, boy?" He asked.

"Sixteen, sir."

"And when do you think you will pay me back the forty dollars your father owed me?" He asked.

John's face got very white. "I don't know, sir." He whispered.

The judge stood up. "I hope you are not like your father." He said. "He was a lazy man who never worked hard." He held out his hand to the boy. "Good luck to you", he said as he shook John's hand. Then he walked with him to the front door and said good night.

During the summer, John worked on other people's farms for forty cents a day. At first, nobody wanted him. People remembered how lazy his father had been. And they gave the work to other boys. But John was a hard worker and he began to get jobs. Soon he was working on other people's farms six days of the week. He worked on his own family's land every evening and all day Sunday. That summer, for the first time, the little farm had enough fruits and vegetables to feed John and his family. There was even enough for them to sell at the market.

John used to wonder how his father had always found time to go fishing. John had very little time to fish that summer and when he did have time to relax, he thought about the forty dollars he owed Judge Don. Then he would go out and look for more work. At first, he gave all the money he earned to his mother. But then, he began saving a few pennies every time he was paid. By the end of August, he had saved a dollar. As he held the money in his hand, he realized for the first time that someday he might be able to pay back all the money he owed to the judge.

By the middle of October, John had saved five dollars to give to the judge. So one night after supper, he went back to the judge's big stone house. He found the judge sitting in his office.

"Sit down, John." The judge said. "I know you have worked hard this summer. I'll be glad to help you if you need some money for the winter."

John felt his face become very hot. "I didn't come here to ask for anything, Judge." He said. He pushed his hand deep into his pocket and pulled out his money. "I wanted to pay back some of the money I owed you. It is only five dollar but here it is." And he handed the money to the judge.

Judge Don counted the money. Then he went to his desk and put the money in a drawer. "Where will you find work this winter, John?"

"I don't know, sir."

Several days later, John's mother asked him to go into town to buy cloth. She wanted to make some warm clothing for the children for the coming winter. On his way into town, John met Seth Whitefeather. Seth was an Indian who also worked on the farms during the summer. But in the winter, Seth traveled north and disappeared into the woods. As they walked toward the town, John told Seth that he had no work for the winter. Seth told John that he went into the woods every winter to hunt and trap wild animals for their fur. Seth said he earned 200 dollars last winter.

"200 dollars!", John thought. He turned shyly to the Indian. "Could I come with you this year?" he asked.

Seth looked at John without smiling. "Have you got a gun and some animal traps?" John shook his head. "No," he said, "how much would that cost?"

"75 dollar" the Indian replied. "If you can get those things I will teach you how to catch the animal I am leaving in two weeks."

Only one person could help John. That night he went to the judge's house. The house was dark except for a light that was shining in the judge's office. John could see the judge sitting at his desk. The boy tapped at the window. Judge Don opened it. When he saw the boy's thin face, he asked, "What do you want?"

"Please, Judge," said John, "Could I talk to you?"

The judge shut the window and opened the front door. They went back to his office.

"Be as quick as you can," the judge said. "It is late." John had never been so frightened in his life. He couldn't think or speak for a few moments. "Talk, boy." The judge barked at him.

So John told him about Seth and the animal fur and asked the judge for the money. "75 dollars?" The judge said, "You are asking me to lend that much money to a 16-year-old boy just like that?"

"I could do it with 50 dollars." John said, "But if you think it is a bad idea, I won't bother you anymore."

"Shut up." The judge said, "If I'm going to lend you money, I want to be sure you don't starve to death in the woods. Then I would never get my money back, would I?" The judge looked hard at John for a few moments. "What about this Seth?", he asked. "Can you trust him?" John nodded his head. "He has always been nice to me", he said.

The judge pulled out a piece of paper from his desk and wrote something on it. "Sign this." He said when he had finished writing. "It says you promise to pay me back 75 dollars by next spring." John was embarrassed to tell the judge that he didn't know how to read or write.

"Put a mark at the bottom instead of your name," the judge said. "Here is the money. Don't lose it." He walked John to the door and shook the boy's hand. "Good luck. Come here as soon as you get back next spring."

APPENDIX B

PRETEST

Name- Surname:
Student number:
Department:

Translate the sentences into Turkish. (Aşağıdaki cümleleri Türkçeye çeviriniz.)
1- The drawer was empty.
_____
2- My father bought a land in Malatya.
_____
3- Chickens like eating corn.
_____
4- The company collects information about sales.
_____
5- I knocked and knocked but nobody answered.
_____
6- Don't bother Maria while she is reading.
_____
7- He has worked on the farm all his life.
_____
8- My father loves fishing.
_____
9- I am glad to see you.
_____
10- She pushed the wardrobe.
_____
11- The teacher counted the mistakes.
_____
12- Use a cloth to clean the shoes!
_____
13-I walked in the woods.
_____
14- My father likes hunting.
_____
15- We trapped the birds.
_____
16- He was carrying a gun.
_____

17-When I looked outside, I saw a bright light.

_____

18- I tapped on the window.

_____

19- I have never felt so embarrassed in my life.

_____

20- I am frightened of spiders.

_____

21- You didn't sign the contract, did you?

_____

22- Put a mark under your name, please!

_____

23- I asked if she was ready to go and she nodded.

_____

24- The rabbit's fur is soft.

_____

25- You don't have to whisper, no one can hear us here.

_____

APPENDIX C

LISTENING COMPREHENSION TEST

Name-Surname:
Student number:
Department:

Listening Comprehension

Please write down everything you remember from the story that you have listened to **in Turkish**. (Lütfen dinlediğiniz hikayede hatırladığınız her şeyi **Türkçe** yazınız.)

APPENDIX-D

VOCABULARY TESTS

Name-Surname:
Student number:
Department:

Vocabulary Test I

Please circle the words you heard in the story. (Lütfen dinlediğiniz hikayede geçen kelimeleri daire içine alınız.)

Pistol	Gun	Hunt
Glad	Knife	Shoot
Fence	Land	Trap
Corn	Safe	Bullet
Kill	Light	Collect
Knock	Strike	Fur
Cut	Tap	Tail
Bother	Walk	River
Tell	Frightened	Woods
Cabin	Helpless	Lake
Farm	Push	Hesitate
Fish	Whisper	Cloth
Nature	Happy	Mark
Delightful	Nod	Cupboard
Brave	Calm	Excited
Take	Sign	Drawer
Count	Blow	Embarrassed
Calculate	Mad	Hopeful

Name-Surname:
Student number:
Department:

Vocabulary Test II

Please write down the meaning of the words/phrases below in English. (Aşağıda gördüğünüz Türkçe kelimelerin İngilizce karşılıklarını yazınız.)

1. Toprak _____land
2. Mısır _____corn
3. Toplamak _____collect
4. Kapı çalmak _____knock
5. Rahatsız etmek _____bother
6. Fısıldamak _____whisper
7. Çiftlik _____farm
8. Balık tutmak _____fish
9. Memnun _____glad
10. İtmek _____push
11. Saymak _____count
12. Çekmece _____drawer
13. Kumaş _____cloth
14. Orman _____woods
15. Avlamak _____hunt
16. Tuzak kurmak _____trap
17. Kürk _____fur
18. Silah _____gun
19. Işık _____light
20. Hafifçe vurmak _____tap
21. Korkmuş _____frightened
22. Başıyla onaylamak _____nod
23. İmzalamak _____sign
24. Utanmış _____embarrassed
25. İmza _____mark

Name-Surname:
Student number:
Department:

Vocabulary Test III

Please write down the meaning of the words/phrases below in Turkish. (Aşağıda gördüğünüz kelimelerin Türkçe karşılıklarını yazınız.)

1. Land (n) _____
2. Corn (n) _____
3. Collect (v) _____
4. Knock (v) _____
5. Bother (v) _____
6. Whisper (v) _____
7. Farm (n) _____
8. Fish (v) _____
9. Glad (adj) _____
10. Push (v) _____
11. Count (v) _____
12. Drawer (n) _____
13. Cloth (n) _____
14. Woods (n) _____
15. Hunt (v) _____
16. Trap (v) _____
17. Fur (n)_____
18. Gun (n) _____
19. Light (n) _____
20. Tap (v) _____
21. Frightened _____
22. Nod (v) _____
23. Sign (v)_____
24. Embarrassed (adj) _____
25. Mark (n) _____

Name-Surname:
Student number:
Department:

Vocabulary Test IV

Choose the option nearest in meaning to the word written in bold below. (Aşağıda siyah olarak belirtilmiş kelimelerin en yakın anlamını seçeneklerden seçiniz).

1) TRAP

A. Cezalandırmak B. Kovmak C. Tuzak kurmak D. Yasaklamak

2) LAND

A. Aşı B. Bitki C. Gübre D. Toprak

3) KNOCK

A. Çöp atmak B. Kapı çalmak C. Seslenmek D. Yanıtlamak

4) FISH

A. Balık beslemek B. Balık pişirmek C. Balık tutmak D. Balık yemek

5) PUSH

A. Dökmek B. İtmek C. Kurmak D. Parçalamak

6) GLAD

A. Memnun B. Minnettar C. Sevecen D. Ümitli

7) BOTHER

A. Hor görmek B. Kin beslemek C. Rahatsız etmek D. Şikayet etmek

8) DRAWER

A. Avize B. Ayna C. Çekmece D. Sehpa

9) COUNT

A. Düzeltmek B. İncelemek C. Listelemek D. Saymak

10) COLLECT

A. Ayırmak B. Çözmek C. Dağıtmak D. Toplamak

11) CLOTH

A. Kumaş B. İplik C. Desen D. Boya

12) WOODS

A. Dere B. Göl C. Nehir D. Orman

13) HUNT

A. Alıkoymak B. Avlamak C. Beslemek D. Tırmanmak

14) GUN

A. Atış B. Hedef C. Mermi D. Silah

15) SIGN

A. İmzalamak B.Kaydetmek C. Resmetmek D. Yazmak

16) FRIGHTENED

A. Sinirli B. Kararsız C. Şaşkın D. Korkmuş

17) TAP

A. Hafifçe vurmak B. Kaldırmak C. Sermek D. Yere bırakmak

18) EMBARRASSED

A. Kuşkulu B. Suskun C. Tedirgin D. Utanmış

19) MARK

A. İmza B. Kağıt C. Pul D. Zarf

20) FARM

A. Bahçe B. Çiftlik C. Sera D.Yayla

21) NOD

A. Başıyla onaylamak B. Red etmek C. Hatırlamak D- Vazgeçmek

22) FUR

A. Deri B. Kuyruk C. Kürk D. Pul

23) WHISPER

A. Açıklamak B. Fısıldamak C. İma etmek D. Önem vermek

24) CORN

A. Arpa B. Buğday C. Mısır D. Pirinç

25) LIGHT

A. Duman B. Işık C.Ses D. Toz

APPENDIX-E

FREQUENCY OF GLOSSED WORD OCCURRENCE

Word	*Frequency*
Corn	5
Farm	4
Land	3
Woods	3
Bother	2
Fish	2
Trap	2
Fur	2
Collect	1
Knock	1
Whisper	1
Glad	1
Push	1
Count	1
Drawer	1
Cloth	1
Hunt	1
Gun	1
Light	1
Tap	1
Frightened	1
Nod	1
Sign	1
Embarrassed	1
Mark	1

REFERENCES

Adelmann, K. (2012). The art of listening in an educational perspective: Listening reception in the mother tongue. *Education Inquiry*, *3*(4), 513-534.

Akbulut, Y. (2007). Effects of multimedia annotations on incidental vocabulary learning and reading comprehension of advanced learners of English as a Foreign Language. *Instructional Science*, *35*(6), 499-517.

Akker, E., & Cutler, A. (2003). Prosodic cues to semantic structure in native and nonnative listening. *Bilingualism: Language and Cognition*, *6*(2), 81-96.

Alderson, J. C. (2000). *Assessing reading*. Cambridge, UK: Cambridge University Press.

Alemi, M., Sarab, M., & Lari, Z. (2012). Successful learning of academic word list via MALL: Mobile-assisted language learning. *International Education Studies*, *5*(6), 99-109. Retrieved from http://www.ccsenet.org/journal/index.php/ies/article/viewFile/18405/13688

Alexander, P. A., & Jetton, T. L. (2003). Learning from traditional and alternative texts: New conceptualization for an information age. In A. C. Graesser, M.A. Gernsbacher, & S. R. Goldman (Eds.), *Handbook of discourse processes* (pp. 199-241). Mahwah, NJ: Erlbaum.

Al-Jarf, R. (2012). Mobile technology and student autonomy in oral skill acquisition. In J. Díaz-Vera (Ed.), *Left to my own devices: Learner autonomy and mobile-assisted language learning innovation and leadership in English language teaching* (pp. 105-130). Bingley, UK: Emerald Group.

Allan, S. (2008). Podcasts and embedded audio to support language learning. *Warwick Interactions Journal*, *30*(2). Retrieved from http://www2.warwick.ac.uk/services/ldc/resource/interactions/issues/issue30

Al-Seghayer, K. (2001). The effect of multimedia annotation modes on L2 vocabulary acquisition: A comparative study. *Language Learning and Technology*, *5*(1), 202-232.

Al-Seghayer, K. (2003). Technological and pedagogical considerations for a more. effective electronic glossary. *The Reading Matrix*, *3*(1), 1-15.

Alvarez, C., Brown, C., & Nussbaum, M. (2011). Comparative study of netbooks and tablet PCs for fostering face-to-face collaborative learning. *Computers in Human Behavior*, *27*(2), 834-844. doi:10.1016/j.chb.2010.11.008

Amer, M. (2010). *Idiomobile for learners of English: A study of learners' usage of a mobile learning application for learning idioms and collocations* (Unpublished doctoral dissertation), Indiana University of Pennsylvania: Indiana, PA.

Anderson, A., & Lynch, T. (1988). *Listening*. Oxford: Oxford University Press.

Anderson, J. R. (1983). *The architecture of cognition*. Cambridge, MA: Harvard University Press.

Anderson, J. R. (2005). *Cognitive psychology and its implications* (6th ed.). New York: Worth Publishing.

Andringa, S., Olsthoorn, N., van Beuningen, C., Schoonen, R., & Hulstijn, J. (2012). Determinants of success in native and nonnative listening comprehension: An individual differences approach. *Language Learning*, *62*(Suppl.2), 49-78. doi:10.1111/j.1467-9922.2012.00706.x

Ariew, R., & Erçetin, G. (2004). Exploring the potential of hypermedia annotations for second language reading. *Computer Assisted Language Learning*, *17*(2), 237-259.

Atkins, P. W. B., & Baddeley, A. D. (1998). Working memory and distributed vocabulary learning. *Applied Psycholinguistics*, *19*(4), 537-552. doi:10.1017/S0142716400010353.

Attewell, J. (2005). *Mobile technologies and learning: A technology update and m-learning project summary*. London: Learning and Skills Development Agency. Retrieved from http://www.m-learning.org/docs/The%20m-learning%20project%20-%20technology%20update%20and%20project%20summary.pdf

Azabdaftari, B., & Mozaheb, M. (2012). Comparing vocabulary learning of EFL learners by using two different strategies: Mobile learning vs. flashcards. *The Eurocall Review*, *20*(2), 47-59. Retrieved from http://www.eurocall-languages.org/wordpress/wp-content/uploads/2014/03/No20_2.pdf

Baddeley, A. D. (1986). *Working memory*. Oxford: Oxford University Press.

Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? *Trends in Cognitive Sciences*, *4*, 417-423.

Baleghizadeh, S., & Oladrostam, E. (2010). The effect of mobile-assisted language learning (MALL) on grammatical accuracy of EFL students. *MEXTESOL Journal*, *34*(2), 77-86. Retrieved from http://www.efltasks.org

Bartolomé, A., & Steffens, K. (2011). Technologies for self-regulated learning. In R. Carneiro, P. Lefrere, K. Steffens, & J. Underwood (Eds.), *Self-regulated learning in technology enhanced learning environments: A European perspective* (pp. 21-31). Rotterdam: Sense Publishers. Retrieved from https://www.sensepublishers.com/media/933-self-regulated-learning-in-technology-enhanced-learning-environments.pdf

Başoğlu, E., & Akdemir, O. (2010). A comparison of undergraduate students' English vocabulary learning: Using mobile phones and flash cards. *Turkish Online Journal of Educational Technology*, *9*(3), 1-7. Retrieved from http://files.eric.ed.gov/fulltext/EJ898010.pdf

Bayyurt, Y., & Karataş, N. B. (2011). Needs analysis as the first step when developing content for mobile language learning. *Boğaziçi University Journal of Education*, *28*(1), 13-21.

Begum, R. (2011). Prospect for cell phones as instructional tools in the EFL classroom: A case study of Jahangirnagar University, Bangladesh. *English Language Teaching*, *4*(1), 105-115. Retrieved from http://www.ccsenet.org/journal/index.php/elt/article/view/6958

Bensalem, E., & Aust, R. (2007). The influence of feature-rich computerized glosses on reading comprehension and vocabulary acquisition. In V. Uskov (Ed.), *Proceeding of the Sixth IASTED International Conference on Web-Based Education* (pp. 663-668). Calgary, Canada: Acta Press.

Bernhardt, E. B. (1991). *Reading development in a second-language*. Norwood, NJ: Ablex.

Blohm, P. J. (1982). Computer-aided glossing and facilitated learning in prose recall. In J. A. Niles & L. A. Harris (Eds.), *New Inquiries in Reading Research and Instruction: Thirty-first Yearbook of the National Reading Conference* (pp. 24-28). Rochester, NY: National Reading Conference.

Bowles, M. A. (2004). L2 glossing: To CALL or not to CALL. *Hispania*, *87*, 541-552.

Bradley, C., & Holley, D. (2011). Empirical research into students' mobile phones and their use for learning. *International Journal of Mobile and Blended Learning*, *3*(4), 38-53.

Brandt, R., & Rice, R. (2013). Mobile medicine practice. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 483-496). New York: Routledge.

Brett, P. (1997). A comparative study of the effect of the use of multimedia on listening comprehension. *System*, *25*(1), 39-51.

Brown, G., & Yule, G. (1983). *Discourse analysis*. Cambridge: Cambridge University Press.

Brown, H. D. (2000). *Principles of language learning and teaching* (4th ed.). White Plains, NY: Addison Wesley Longman.

Brown, H. D. (2001). *Teaching by principle–An interactive approach to language pedagogy*. New York: Addison Wesley Longman.

Brown, M., Castellano, J., Hughes, E., & Worth, A. (2012). Integration of iPads in a Japanese university English language curriculum. *The JALT CALL Journal, 8 (3)*, 197-209. Retrieved from http://journal.jaltcall.org/articles/8_3_Brown.pdf

Brown, R., Waring, R., & Donkaewbua, S. (2008). Incidental vocabulary acquisition from reading, reading-while-listening, and listening to stories. *Reading in a Foreign Language*, *20*(2), 136-163.

Bruton, A., López, M. G., & Mesa, R. E. (2011). Incidental L2 vocabulary learning: An impracticable term? *TESOL Quarterly*, *45*, 759–768.

Butgereit, L., & Botha, A. (2009). Hadeda: The noisy way to practice spelling vocabulary using a cell phone. In P. Cunningham & M. Cunningham (Eds.), *IST-Africa 2009 Conference Proceedings* (pp. 1-7). Retrieved from http://researchspace.csir.co.za

Call, M. E. (1985). Auditory short-term memory, listening comprehension, and the input hypothesis. *TESOL Quarterly*, *19*(4), 765-781.

Carroll, D. (1994). *Psychology of language*. California: Brooks/Cole Publishing Company.

Chamot, A. U. (1995). Learning strategies and listening comprehension. In D. J. Mendelsohn & J. Rubin (Eds.), *A guide for the teaching of second language listening* (pp. 13-30). San Diego: Dominie Press.

Chamot, A.U. (2004). Issues in language learning strategy research and teaching. *Electronic Journal of Foreign Language Teaching*, *1*(1), 14-26.

Chang, C-K., & Hsu, C-K. (2011). A mobile-assisted synchronously collaborative translation-annotation system for English as a foreign language (EFL) reading comprehension. *Computer Assisted Language Learning*, *24*(2), 155-180.

Chang, Y. (2006). On the use of the immediate recall task as a measure of second language reading comprehension. *Language Testing*, *23*, 520-543.

Chapelle, C. (2001). *Computer applications in second language acquisition: Foundations for teaching, testing and research*. Cambridge: Cambridge University Press.

Chen, C-M., & Hsu, S-H. (2008). Personalized intelligent mobile learning system for supporting effective English learning. *Educational Technology & Society*, *11*(3), 153-180.

Chen, I-J., & Chang, C-C. (2011). Content presentation modes in mobile language listening tasks: English proficiency as a moderator. *Computer Assisted Language Learning*, *24*(5), 451-470. doi:10.1080/09588221.2011.577749

Chen, N-S., Hsieh, S-W., & Kinshuk (2008). Effects of short-term memory and content representation type on mobile language learning. *Language Learning & Technology*, *12*(3), 93-113. Retrieved from http://llt.msu.edu/vol12num3/chenetal.pdf

Chen, Y. S., Kao, T. C., Yu, G. J., & Sheu, J. P. (2004). A mobile butterfly-watching learning system for supporting independent learning. In J. Roschelle, T-W. Chan, Kinshuk, & S. J. H. Yang (Eds.), *Proceedings of the Second IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE 2004)* (pp. 11-18). Los Alamitos, CA: IEEE Computer Society

Cheng, Y. H., & Good, R. L. (2009). L1 glosses: Effects on EFL learners' reading comprehension and vocabulary retention. *Reading in a Foreign Language*, *21*(2), 119-142.

Cheon, J., Sangno, L., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education*, *59*, 1054-1064.

Chinnery, G. M. (2006). Going to the MALL: Mobile-assisted language learning. *Language Learning & Technology*, *10*(1), 9-16.

Cho, K. S., & Krashen, S. (1994). Acquisition of vocabulary from the Sweet Valley Kids series. *Journal of Reading*, *37*(8), 662-667.

Chun, D. M. (1994). Using computer networking to facilitate the acquisition of interactive competence. *System*, *22*(1), 17-31.

Chun, D. M. (2001). L2 reading on the web: strategies for accessing information in hypermedia. *Computer Assisted Language Learning*, *14*(5), 367-403.

Chun, D. M., & Plass, J. L. (1996a). Effects of multimedia annotations on vocabulary acquisition. *Modern Language Journal*, *80*, 183-198.

Chun, D. M., & Plass, J. L. (1996b). Facilitating reading comprehension with multimedia. *System*, *24*, 503-519.

Chung, U. (1994). *The effect of audio, a single picture, multiple pictures, or video on second-language listening comprehension* (Unpublished PhD dissertation), University of Illinois at Urbana-Champaign: Champaign, IL.

Clark, R. C., & Mayer, R. E. (2008). *E-learning and the science of instruction* (2nd ed.). San Francisco: Jossey-Bass/Pfeiffer.

Clarke, P., Keing, C., Lam, P., & McNaught, C. (2008). Using SMSs to engage students in language learning. *Proceedings of World Conference on Educational*

Multimedia, Hypermedia and Telecommunications (pp. 6132-6141). Chesapeake, VA: AACE. Retrieved from http://www.cuhk.edu.hk

Coady, J. (1993). Research on ESL/EFL vocabulary acquisition: Putting it in context. In T. Huckin, M. Haynes, & J. Coady (Eds.), *Second language reading and vocabulary learning* (pp. 3-23). Norwood, NJ: Ablex Publishing.

Cochrane, T. (2012). A summary and critique of mlearning research and practice. In Z. Berge & L. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 24-34). New York: Routledge.

Colpaert, J. (2004). *Design of online interactive language courseware: Conceptualization, specification and prototyping, research into the impact of linguistic-didactic functionality on software architecture*. Antwerp, Belgium: University of Antwerp.

Conrad, L. (1985). Semantic versus syntactic cues in listening comprehension. SSLA, 7, 59-69. Engle, R. W. (2001). What is working-memory capacity? In H. L. Roediger III & J. S. Nairne (Eds.), *The nature of remembering: Essays in honor of Robert G. Crowder* (pp. 297-314). Washington, DC: American Psychological Association.

Cook, M., & Liddicoat, A. J. (2002). The development of comprehension in interlanguage pragmatics: The case of request strategies in English. *Australian Review of Applied Linguistics*, *25*, 19-39.

Cooney, G., & Keogh, K. A. (2007 October). *Use of mobile phones for language learning and assessment for learning: A pilot project*. Paper presented at mLearn Conference, Melbourne, Australia.

Corbeil, J. R., & Valdes-Corbeil, M. E. (2007). Are you ready for mobile learning? *Educause Quarterly, 30*(2), 51-58.

Cottam, M. (2010). *The effects of visual and textual annotations on Spanish listening comprehension, vocabulary acquisition and cognitive load* (Unpublished doctoral dissertation). Arizona State University: Phoenix, AZ.

Cottam, M. E., & Savenye, W. (2008, November). *The effects of visual and textual annotations on Spanish listening comprehension, incidental vocabulary acquisition and cognitive load*. Poster presented at the Annual Conference of the Association of Educational Communication and Technology, Orlando, FL.

Cowan, N. (1993). Activation, attention, and short-term memory. *Memory & Cognition*, *21*(2), 162-167.

Cutler, A. (2001). Listening to a second language through the ears of a first, *Interpreting*, *5*, 1-23.

Çavuş, N., & İbrahim, D. (2008). MOLT: A mobile learning tool that makes learning new technical English language words enjoyable. *International Journal of Interactive Mobile Technologies*, *2*(4), 38-42. Retrieved from http://online-journals.org/index.php/i-jim/article/view/530

Dansereau, D. F. (1983). *Cooperative learning: Impact on acquisition of knowledge and skills* (Report No. 341). Abilene, TX: U.S. Army Research Institute for the Behavioral and Social Sciences.

Davis, J. N. (1989). Facilitating effects of marginal glosses on foreign language reading. *The Modern Language Journal*, *73*(1), 41-48.

De Ridder, I. (2002). Visible or invisible links: Does the highlighting of hyperlinks affect incidental vocabulary learning, text comprehension, and the reading process? *Language Learning & Technology*, *6*, 123-146.

Dean, J. (2011). *Smartphone user survey: A glimpse into the mobile lives of college students.* Retrieved from http://testkitchen.colorado.edu/projects/reports/smartphone/smartphone-survey/.

Deimann, M., & Keller, J. (2006). Volitional aspects of multimedia learning. *Journal of Educational Multimedia and Hypermedia*, *15*(2), 137-158.

Demouy, V., & Kukulska-Hulme, A. (2010). On the spot: Using mobile devices for listening and speaking practice on a French language programme. *The Journal of Open, Distance and e-Learning*, *25*(3), 217-232. Retrieved from http://oro.open.ac.uk

Demouy, V., Eardley, A., Shrestha, P., & Kukulska-Hulme, A. (2011). The Interactive Oral Assessment (IOA) project; using Talkback® for practice and assessment of listening and speaking skills in languages. *Proceedings of ICL 2011 Interactive Collaborative Learning* (pp. 126-129). Piešťany, Slovakia: IEEE Computer Society.

Dillon, A., & Gabbard, R. (1998). Hypermedia as an educational technology: A review of the quantitative research literature on learner comprehension, control, and style. *Review of Educational Research*, *68*, 322-349.

Dipper, L. T., Black, M., & Bryan, K. (2005). Thinking for speaking and listening: the interaction of thought and language in typical and nonfluent comprehension production. *Language and Cognitive Processes*, *20*, 417-441.

Dunkel, P. A. (1991). Listening in the native and second/foreign language: toward an integration of research and practice. *TESOL Quarterly*, *25*, 431-457.

Ebner, M., Stickel, C., Scerbakov, N., & Holzinger, A. (2009). A study on the compatibility of ubiquitous learning (u-learning) systems at university level. In C. Stephanidis (Ed.), *Universal access in human-computer interaction* (pp. 34-43). Berlin, Heidelberg: Springer.

Elkhafaifi, H. (2005). Listening comprehension and anxiety in the Arabic language classroom. *The Modern Language Journal*, *89*(2), 206-220. doi: 10.1111/j.1540-4781.2005.00275.x

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

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

Erçetin, G. (2003). Exploring ESL learners' use of hypermedia reading glosses. *CALICO Journal*, *20*(2), 261-283.

Farvardin, M., & Biria, R. (2012). The impact of glosses types on Iranian EFL students reading comprehension and lexical retention. *International Journal of Instruction*, *5*(1), 99-114.

Feyten, C. M. (1991). The power of listening ability: An overlooked dimension in language acquisition. *The Modern Language Journal*, *73*(2), 173-180.

Field, J. (2004). An insight into listener' problems: Too much bottom-up or too much top down? *System*, 32, 363-377.

Fischer, R. (2007). How do we know what students are actually doing? Monitoring students' behavior in CALL. *Computer Assisted Language Learning*, *20*(5), 409-442.

Flowerdew, J., & Miller, L. (2005). *Second language listening: Theory and practice*. Cambridge: Cambridge University Press.

Fuchs, L. S., Fuchs, D., & Maxwell, L. (1988). The validity of informal reading comprehension measures. *Remedial and Special Education*, *9*(2), 20-29.

Fuente, J. M. (2014). Learner's attention to input during focus on form listening tasks: the role of mobile technology in the second language classroom. *Computer Assisted Language Learning*, *27*(3), 161-276.

Gabarre, S., & Gabarre, C. (2010). Utilising mobile phones as a language learning tool. In T. B. Hoon, Y. M. Fung, & Y. N. Thai (Eds.), *Language learning: challenges,*

approaches and collaboration (pp. 92-118). Saarbrücken, Germany: VDM Verlag Dr. Müller GmbH & Co. KG.

Garza, T. J. (1991). Evaluating the use of captioned video materials in advanced foreign language learning. *Foreign Language Annals*, *24*(3), 239-258. doi:10.1111/j.1944-9720.1991.tb00469.x

Gasigijtamrong, J. (2013). Effects of multimedia annotations on Thai EFL readers' words and text recall. *English Language Teaching*, *6*(12), 48-57.

Gass, S. M. & Selinker, L. (2001). *Second language acquisition: An introductory course*. London: Lawrence Earlbaum.

Georgiev, T., Georgieva, E., & Smrikarov, A. (2004, June). *M-learning: a new stage of e-learning*. Paper presented at the Fifth International Conference on Computer Systems and Technologies, Rousse, Bulgaria.

Gettys, S., Imhof, L., & Kautz, J. (2001). Computer-assisted reading: The effect of glossing format on comprehension and vocabulary retention. *Foreign Language Annals*, *34*(2), 91-106.

Gilgen, R. (2005). Holding the world in your hand: Creating a mobile language learning environment. *EDUCAUSE Quarterly*, *28*(3), 30-39. Retrieved from https://net.educause.edu/ir/library/pdf/EQM0535.pdf

Goh, C. (1997). Metacognitive awareness and second language listeners. *ELT Journal*, *51*(4), 361-369.

Goh, C. (2002). *Teaching listening in the language classroom*. Singapore: SEAMEO Regional Language Centre.

Goh, C. C. M. (2000). A cognitive perspective on language learners' listening comprehension problems. *System*, *28*, 55-75.

Graham, S. (2003). Learner strategies and advanced level listening comprehension. *Language Learning Journal*, *28*(1), 64-69.

Gromik, N. (2012). Cell phone video recording feature as a language learning tool: A case study. *Computers & Education*, *58*(1), 223-230.

Harley, B. (2000). Listening strategies in ESL: Do age and L1 make a difference? *TESOL Quarterly*, *34*, 769-777.

Hasegawa, K., Ishikawa, M., Shinagawa, N., Kaneko, K., & Mikakoda, H. (2008). Learning effects of self-made vocabulary learning materials. *Proceedings of IADIS International Conference on Cognition and Exploratory Learning in Digital Age 2008* (pp.153-158). Lisbon: IADIS.

Henriksen, B. (1999). Three dimensions of vocabulary development. *Studies in Second Language Acquisition*, *21*(2), 303-317.

Herrington, J., Herrington, A., Mantei, J., Olney, I., & Ferry, B. (2009). Using mobile technologies to develop new ways of teaching and learning. In J. Herrington, A. Herrington, Mantei, J, Olney, I., & Ferry, B. (Eds.), *New technologies, new pedagogies: Mobile learning in higher education* (pp. 1-14). University of Wollongong: Australia. Retrieved from http://ro.uow.edu.au/newtech

Herron, C., Hanley, J., & Cole, S. (1995). A comparison study of two advance organizers for introducing beginning foreign language students to video. *Modern Language Journal*, *79*(3), 387-394.

Hong, X. (2010). Review of effect of glosses on incidental vocabulary learning and reading comprehension. *Chinese Journal of Applied Linguistics*, *33*(1), 54-73.

Hoven, D., & Palalas, A. (2011). (Re)conceptualizing design approaches for mobile language learning. *CALICO Journal*, *28*(3), 699-720.

Horst, M., Cobb, T., & Meara, P. (1998). Beyond a Clockwork Orange: Acquiring second language vocabulary through reading. *Reading in a Foreign Language*, *11*(2), 207-223.

Hsu, C-K., He, Y-Y., & Chang, C-K. (2009). Evaluation of a MALL system integrating instant translation and shared annotation for ESL reading on PDA. In I. Gibson et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2009* (pp. 898-904). Chesapeake, VA: AACE. Retrieved from http://www.editlib.org/p/30719/

Hu, S-M., Vongpumivitch, V., Chang, J. S., & Liou, H-C. (2014). The effects of L1 and L2 e-glosses on incidental vocabulary learning of junior high-school English students. *ReCALL*, *26*(1), 80-99.

Huck, S. W. (2000). *Reading statistics and research* (3rd ed.). New York: Longman.

Huckin, T., & Coady, J. (1999). Incidental vocabulary acquisition in a second language: A review. *Studies in Second Language Acquisition*, *21*(2), 181-193.

Hulstijn, J. H. (1992). Retention of inferred and given word meanings: Experiments in incidental learning. In P. J. L. Arnaud & H. Béjoint (Eds.), *Vocabulary and applied linguistics* (p.113-125). London: Macmillan.

Hulstijn, J. H. (1993). When do foreign-language readers look up the meaning of unfamiliar words? The influence of task and learner variables. *The Modern Language Journal*, *77*, 139-147.

Hulstijn, J. H. (1998). Implicit and incidental second language learning: Experiments in processing of natural and partly artificial input. In H.W. Dechert & M. Raupach, (Eds.), *Interlingual processes* (pp. 49-73). Tübingen: Narr.

Hulstijn, J. (2001). Intentional and incidental second language vocabulary learning: A reappraisal of elaboration, rehearsal and automaticity. In P. Robinson (Ed.), *Cognition and second language acquisition instruction* (pp. 258-286). Cambridge, UK: Cambridge University Press.

Hulstijn, J. H., Hollander, M., & Greidanus, T. (1996). Incidental vocabulary learning by advanced foreign-language students: The influence of marginal glosses, dictionary use, and reoccurrence of unknown words. *The Modern Language Journal*, *80*, 327-339.

Hulstijn, J. H., & Laufer, B. (2001). Some empirical evidence for the involvement load hypothesis in vocabulary acquisition. *Language Learning*, *51*(3), 539-558.

Hwang, W-Y., Chen, C-Y., & Chen, H. (2011). Facilitating EFL writing of elementary school students in familiar situated contexts with mobile devices. In *10th World Conference on Mobile and Contextual Learning (mLearn)* (pp. 15-23). Beijing, China: Beijing Normal University. Retrieved from http://mlearn.bnu.edu.cn/source/Conference_Procedings.pdf

Jacobs, G. M., Dufon, P., & Fong, C. H. (1994). L1 and L2 vocabulary glosses in L2 reading passages: Their effectiveness for increasing comprehension and vocabulary knowledge. *Journal of Research in Reading*, *17*(1), 19-28.

Jarvella, R. J. (1971). Syntactic processing of connected speech. *Journal of Verbal Learning and Verbal Behavior*, *10*(4), 409-416.

Jensen, C., & Hansen, C. (1995). The effect of prior knowledge on EAP listening-test performance. *Language Testing*, *12*(1), 99-119.

Johnson, K. (2008). *An introduction to foreign language learning and teaching* (2nd ed.). Harlow, England: Pearson.

Johnson, R. E. (1970). Recall of prose as a function of the structural importance of the linguistic units. *Journal of Verbal Learning and Verbal Behavior*, *9*, 12-20.

Jones, L. C. (2003). Supporting listening comprehension and vocabulary acquisition with multimedia annotations: The students' voice. *CALICO Journal*, *21*, 41-65. Retrieved from https://calico.org/memberBrowse.php?action=article&id=281

Jones, L. C. (2004). Testing L2 vocabulary recognition and recall using pictorial and written test items. *Language Learning & Technology*, *8*(3), 122-143. Retrieved from http://llt.msu.edu/vol8num3/jones/default.html

Jones, L. C. (2006). Effects of collaboration and multimedia annotations on vocabulary learning and listening comprehension. *CALICO Journal*, *24*, 33-58. Retrieved from https://calico.org/memberBrowse.php?action=article&id=81

Jones, L. C., & Plass, J. L. (2002). Supporting listening comprehension and vocabulary acquisition in French with multimedia annotations. *The Modern Language Journal*, *86*, 546-561.

Joyce, E. E. (1997). Which words should be glossed in L2 reading materials? A study of first, second and third semester French students' recall. *Pennsylvania Language Forum*, 58-64. Retrieved from http://files.eric.ed.gov/fulltext/ED427508.pdf

Juffs, A., & Harrington, M. W. (2011). Aspects of working memory in L2 learning. *Language Teaching: Reviews and Studies*, *42*(2), 137-166.

Just, A. M., & Carpenter, A. P. (1992). A capacity theory of comprehension: Individual differences in working memory. *Psychological Review*, *99*(1), 122-149. Retrieved from http://www.ccbi.cmu.edu/reprints/Just_PsychRev-1992_capacity-theory.pdf

Keating, G. D. (2008). Task effectiveness and word learning in a second language: The involvement load hypothesis on trial. *Language Teaching Research*, *12*(3), 365-386.

Kennedy, C., & Levy, M. (2008, August). *Mobile learning to Italian: Extending and refining the approach*. Paper presented at WorldCALL conference, CALL Bridges the World, Fukuoka International Congress Centre and Fukuoka University, Fukuoka, Japan.

Keough, M. (2005). *7 reasons why mlearning doesn't work*. Paper presented at the 4th World Conference on mLearning (mLearn 2005), Cape Town, South Africa. Retrieved from http://www.mlearn.org.za/CD/papers/McMillan-Keough.pdf

Killilea, J. (2012). Leveraging mobile devices for asynchronous learning: Best practices. *Proceedings of the 2012 Autumn Simulation Conference on Education and Training Modeling & Simulation (ETMS'12)*. San Diego, CA: The Society for Modeling and Simulation International.

Kim, D., & Gilman, D. A. (2008). Effects of text, audio, and graphic aids in multimedia instruction for vocabulary learning. *Educational Technology & Society*, *11*(3), 114-126.

Kim, H-S. (2011). Effects of SMS text messaging on vocabulary learning. *Multimedia-Assisted Language Learning*, *14*(2), 159-180. Retrieved from http://kmjournal.bada.cc/wp-content/uploads/2013/05/14-2-7HSKim.pdf

Kim, Y. (2008). The role of task-induced involvement and learner proficiency in L2 vocabulary acquisition. *Language Learning*, *58*(2), 285-325.

Kneebone, R. (2005). PDAs for PSPs. In A. Kukulska-Hulme & J. Traxler (Eds.), *Mobile Learning: A Handbook for educators and trainers* (pp. 106-115). London: Routledge.

Knight, S. (1994). Dictionary use while reading: The effects on comprehension and vocabulary acquisition for students of different verbal abilities. *Modern Language Journal*, *78*(3), 285-299.

Ko, M. (2005). Glosses, comprehension, and strategy use. *Reading in a foreign language*, *17*(2), 125-143.

Ko, M. (2012). Glossing and language vocabulary learning. *TESOL Quarterly*, *46*(1), 56-78.

Kobayashi, C. (2008). The use of pocket electronic and printed dictionaries: A mixed-method study. In K. Bradford Watts, T. Muller, & M. Swanson (Eds.), *JALT 2007 Conference Proceedings* (pp. 657-671). Tokyo, Japan: JALT. Retrieved from jalt-publications.org/archive/proceedings/2007/E124.pdf

Kost, C. R., Foss, P., & Lenzini, J. J. (1999). Textual and pictorial glosses: Effectiveness on incidental vocabulary growth when reading in a foreign language. *Foreign Language Annals*, *32*(1), 89-97.

Koyama, T., & Takeuchi, O. (2004). Comparing electronic and printed dictionaries: How the difference affected EFL learning. *JACET Bulletin*, *38*, 33-46.

Koyama, T., & Takeuchi, O. (2009). How effectively do good language learners use handheld electronic dictionaries: A qualitative approach. *Language Education & Technology*, *46*, 131-150. Retrieved from http://kuir.jm.kansai-u.ac.jp/dspace/bitstream/10112/4793/1/KU-1100-20090600-05.pdf

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

Kress, G., & Pachler, N. (2007). Thinking about the 'm' in m-learning. In N. Pachler (Ed.), *Mobile Learning: Towards a Research Agenda* (pp. 7-32). London: WLE Centre, Institute of Education. Retrieved from http://www.wlecentre.ac.uk/cms/files/occasionalpapers/mobilelearning_pachler_2007.pdf

Kukulska-Hulme, A. (2006). Mobile language learning now and in the future. In P. Svensson (Ed.) *Fr˚an vision till praktik: Spr˚akutbildning och Informationsteknik (From vision to practice: language learning and IT)* (pp. 295–310). Sweden: Swedish Net University (N¨atuniversitetet).

Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL*, *21*(2), 157-165.

Kukulska-Hulme, A. (2010). Charting unknown territory: Models of participation in mobile language learning. *International Journal of Mobile Learning and Organisation*, *4*(2), 116-129.

Kukulska-Hulme, A., & Bull, S. (2009). Theory-based support for mobile language learning: Noticing and recording. *International Journal of Interactive Mobile Technologies 3*(2), 12-18.

Kukulska-Hulme, A., & Shield, L. (2008). An overview of mobile-assisted language learning: From content delivery to supported collaboration and interaction. *ReCALL*, *20*(3), 271–289.

Kukulska-Hulme, A., & Traxler, J. (Eds.) (2005). *Mobile Learning: A handbook for educators and trainers*. Abingdon: Routledge.

Kukulska-Hulme, A., & Traxler, J. (2013). Design principles for mobile learning. In H. Beetham & R. Sharpe (Eds.), *Rethinking pedagogy for a digital Age: designing for 21st century learning* (2nd ed., pp. 244-257). Abingdon: Routledge.

Kukulska-Hulme, A., Traxler, J., & Pettit, J. (2007). Designed and user-generated activity in the mobile age. *Journal of Learning Design*, *2*(1), 52-65. Retrieved from http://www.jld.qut.edu.au/

Lan, Y. J., Sung, Y. T., & Chang, K. E. (2007). A mobile-device-supported peer-assisted learning system for collaborative early EFL reading. *Language Learning & Technology*, *11*(3), 130-151. Retrieved from http://llt.msu.edu/vol11num3/pdf/lansungchang.pdf

Laufer, B. (2005). Focus on Form in second language vocabulary acquisition. In S. H. Foster-Cohen, M. P. Garcia-Mayo, & J. Cenoz.Benjamins (Eds.), *EUROSLA Yearbook 5* (pp. 223-250). Amsterdam: John Benjamins.

Laufer, B., & Goldstein, Z. (2004). Testing vocabulary knowledge: Size, strength, and computer adaptiveness. *Language Learning*, *54*(3), 399-436.

Laufer, B., & Hill, M. (2000). What lexical information do L2 learners select in a CALL dictionary and how does it affect word retention? *Language Learning & Technology*, *3*(2), 58-76.

Laufer, B., & Hulstijn, J. H. (2001). Incidental vocabulary acquisition in a second language: The construct of task-induced involvement. *Applied Linguistics*, *22*(1), 1-26.

Laufer, B., & Rozovski-Roitblat, B. (2011). Incidental vocabulary acquisition: The effects of task type, word occurrence and their combination. *Language Teaching Research*, *15*(4), 391-411.

Lawson, M. J., & Hogben, D. (1996). The vocabulary-learning strategies of foreign-language students. *Language Learning*, *46*(1), 101-135.

Leffa, V. J. (1992). Making foreign language texts comprehensible for beginners: An experiment with an electronic glossary. *System*, *20*, 63-73.

Lenders, O. (2008). Electronic glossing-is it worth the effort? *Computer Assisted Language Learning*, *21*(5), 457-481.

Leslie, L., & Caldwell, J. (1990). *Qualitative reading inventory*. Boston: Pearson.

Levert, G. L. (2006). Designing for mobile learning: Clark and Mayer's principles applied. *Learn Solutions*. Retrieved from http://www.learningsolutionsmag.com/articles/222/designing-for-mobile-learning-clark-and-mayers-principles-applied/pageall

Lew, R., & Doroszewska, J. (2009). Electronic dictionary entries with animated pictures: Lookup preferences and word retention. *International Journal of Lexicography*, *22*(3), 239-257.

Li, Z., & Hegelheimer, V. (2013). Mobile-assisted grammar exercises: Effects on self-editing in L2 writing. *Language Learning & Technology*, *17*(3), 135-156. Retrieved from http://llt.msu.edu/issues/october2013/lihegelheimer.pdf

Lin, C-P., Liu, K-P., & Niramitranon, J. (2008). Tablet PC to support collaborative learning: An empirical study of English vocabulary learning. In *Fifth IEEE International Conference on Wireless, Mobile, and Ubiquitous Technology in Education* (pp. 47–51). Los Alamitos, CA: IEEE Computer Society. Retrieved from http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4489787

Lindquist, D., Denning, T., Kelly, M., Malani, R., Griswold, W. G., & Simon, B. (2007). Exploring the potential of mobile phones for active learning in the classroom. *ACM SIGCSE Bulletin*, *39*(1), 384-388.

Liu, P-L., & Chen, C-J. (2012). A study of mobile-assisted photo-taking for English phrase learning and sentence making. In J. Colpaert, A. Aerts, W-C. V. Wu, & Y-C. J. Chao (Eds.), *Proceedings 15th International CALL Research Conference)* (pp. 762-765). Taichung, Taiwan: Providence University.

Lomicka, L. (1998). To gloss or not to gloss an investigation of reading comprehension online, language learning and technology. *Language Learning and Technology*, *1*(2), 41-50.

Lu, M. (2008). Effectiveness of vocabulary learning via mobile phone. *Journal of Computer Assisted Learning*, *24*(6), 515-525.

Lundin, J., & Magnusson, M. (2003). Collaborative learning in mobile work. *Journal of Computer Assisted Learning*, *19*(3), 273-283.

Lunts, E. (2002). What does the literature say about the effectiveness of learner control in computer-assisted instruction? *Electronic Journal for the Integration of Technology in Education*, *1*(2), 59-75.

Lyman-Hager, M., Davis, J. N., Burnett, J., & Chennault, R. (1993). Une vie de boy: Interactive reading in French. In F. L. Borchardt & E. M. T. Johnson (Eds.), *Proceedings of the CALICO 1993 Annual Symposium on Assessment* (pp. 93-97). Durham, NC: Duke University.

Lynch, T. (1998). Theoretical perspectives on listening. *Annual Review of Applied Linguistics, 18*, 3-19.

Ma, Q. (2013). Computer assisted vocabulary learning: Framework and tracking user data. In P. Hubbard, M. Schulze, & B. Smith (Eds.), *Learner-computer interaction in language education: A festschrift in honor of Robert Fischer* (pp. 230-243). San Marcos, Texas: Computer-Assisted Language Instruction Consortium, Texas State University.

Macaro, E., Graham, S., & Vanderplank, R., (2007). A review of listening strategies: focus on sources of knowledge and on success. In A. D. Cohen & Macaro, E. (Eds.), *Language learner strategies: 30 Years of research and practice* (pp. 165-185). Oxford University Press, Oxford.

Maleki, A., & Rad, M. S. (2011). The effect of visual and textual accomplishments to verbal stimuli on the listening comprehension test performance of Iranian high and low proficient EFL learners. *Theory and Practice in Language Studies*, *1*(1), 28-36.

Markham, P. (1999). Captioned videotapes and second-language listening word recognition. *Foreign Language Annals*, *32*(3), 321–328. doi:10.1111/j.1944-9720.1999.tb01344.x

Martin, J. (2004). Self-regulated learning, social cognitive theory, and agency. *Educational Psychologist*, *39*(3), 135-145.

Martinez-Lage, A. (1997). Hypermedia technology for teaching reading. In M. Bush & R. Terry (Eds.), *Technology enhanced language learning* (pp. 121-163). Lincolnwood, IL: National Textbook Company.

Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist*, *32*(1), 1-19.

Mayer, R. E. (2001). *Multimedia learning*. New York: Cambridge University Press.

Mayer, E. R., & Chandler, P. (2001). When learning is just a click away: does simple user interaction foster deeper understanding of multimedia messages? *Journal of Educational Psychology*, *93*(2), 390-397.

Mayer, R. E., & Moreno, R. (2002). Aids to computer-based multimedia learning. *Learning and Instruction*, *12*(1), 107-119.

Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia mearning. *Educational Psychologist*, *38*(1), 43-52.

Mendelsohn, D. J. (1994). *Learning to listen*. San Diego: Dominie Press.

Mendelsohn, D. J. (1995). Applying learning strategies in the second foreign language listening comprehension lesson. In D. Mendelsohn & J. Rubin (Eds.), *A guide for the teaching of second language listening* (pp.132-150). San Diego: Dominie Press.

Mendelsohn, D. J. (1998). Teaching listening. *Annual Review of Applied Linguistics*, *18*, 81-101.

Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, *63*(2), 81-97.

Miyasako, N. (2002). Does text-glossing have any effects on incidental vocabulary learning through reading for Japanese senior high school students? *Language Education & Technology*, *39*, 1-20.

Moazzeni, M., Bagheri, S. M., Sadighi, F., & Zamanian, M. (2014). The effect of different gloss types on incidental vocabulary retention of Iranian EFL students. *International Journal of Language Learning and Applied Linguistics World (IJLLALW)*, *5*(2), 396-415. Retrieved from http://www.ijllalw.org/finalversion5232.pdf

Morley, J. M. (1991). Listening comprehension in second/foreign language instruction. In M. Celce-Murcia (Ed.*), Teaching English as a second or foreign language* (2nd ed., pp. 81-106). New York: Newbury House.

Morrow, L. M. (1988). Young children's responses to one-to-one story readings in school settings. *Reading Research Quarterly*, *23*(1), 89-107.

Motallebzadeh, K., Beh-Afarin, R., & Daliry Rad, S. (2011). The effect of short message service on the retention of collocations among Iranian lower intermediate EFL learners. *Theory and Practice in Language Studies*, *1*(11), 1514–1520. Retrieved from https://www.academypublisher.com/~academz3/ojs/index.php/tpls/article/viewFile/011115141520/3870

Motiwalla, L. F. (2007). Mobile Learning: A framework and evaluation. *Computers & Education*. *49*(3), 581-596.

Myers, J. L. (1990). Causal relatedness and text comprehension. In D. A. Balota, G. B. Flores D'Arcais, & K. Rayner (Eds.), *Comprehension processes in reading* (pp. 361-375). Hillsdale, NJ: Lawrence Erlbaum Associates.

Nagata, N. (1999). The effectiveness of computer-assisted interactive glosses. *Foreign Language Annals*, *32*(4), 469-479.

Nah, K-C., White, P., & Sussex, R. (2008). The potential of using a mobile phone to access the Internet for learning EFL listening skills within a Korean context. *ReCALL Journal*, *20*(3), 331–347. doi:10.1017/S0958344008000633

Naiman, N., Frohlich, M., Stern, H., & Todesco, A. (1978). *The good language learner* (Research in Education Series No 7). Toronto: Ontario Institute for Studies in Education.

Naismith, L., & Corlett, D. (2006, October). *Reflections on success: A retrospective of the mLearn conference series 2002-2005*. Paper presented at mLearn 2006 Conference. Banff, Canada: Athabasca University.

Naismith, L., Lonsdale, P., Vavoula, G., & Sharples, M. (2004). *NESTA Futurelab Report 11: Literature review in mobile technologies and learning*. Bristol, UK: NESTA Futurelab. Retrieved from http://archive.futurelab.org.uk/resources/documents/lit_reviews/Mobile_Review.pdf

Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.

Ogata, H., & Yano, Y. (2004). Context-aware support for computer-supported ubiquitous learning. *Proceedings of IEEE International Workshop on Wireless and Mobile Technologies in Education (WMTE)* (pp. 27-34). Los Alamitos, CA: IEEE Computer Society Press.

O'Brien, I., Segalowitz, N., Freed, B., & Collentine, J. (2007). Phonological memory predicts second language oral fluency gains in adults. *Studies in Second Language Acquisition*, *29*, 557-581.

O'Donnell, M. E. (2009). Finding middle ground in second language reading: Pedagogic modifications that increase comprehensibility and vocabulary acquisition while preserving authentic features. *Modern Language Journal*, *93*(4), 512-533.

O'Donnell, M. E. (2013). Second language learners' use of marginal glosses. *Foreign Language Annals*, *45*(4), 543-563.

O'Malley, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition*. Cambridge, UK: Cambridge University Press.

O'Malley, J. M., Chamot, A. U., & Kupper, L. (1989). Listening comprehension strategies in second language acquisition. *Applied Linguistics*, *10*(4), 418-437.

O'Malley, J. M., Chamot, A. U., Stewner-Manzanares, G., Kupper, L., & Russo, R. P. (1985). Learning strategies used by beginning and intermediate ESL students. *Language Learning*, *35*(1), 21-46.

O'Malley, C., Vavoula, G., Glew, J., Taylor, J., Sharples, M., & Lefrere, P. (2003). *Guidelines for learning/teaching/tutoring in a mobile environment*. Retrieved from http://www.mobilearn.org/download/results/guidelines.pdf

Oxford, R. L. (1990). *Language learning strategies: What every teacher should know*. Boston: Heinle & Heinle.

Paivio, A. (1986). *Mental representations: A dual-coding approach*. New York: Oxford University Press.

Palalas, A. (2009). Using mobile devices to extend English language learning outside the classroom. In D. Metcalf, A. Hamilton, & C. Graffeo (Eds.), *Mlearn2009: Eighth World Conference on Mobile and Contextual Learning Proceedings* (pp. 179-183). Orlando, FL: University of Central Florida.

Palalas, A., & Olenewa, J. (2012). *Mobile-assisted language learning: Enhancing student learning with mobile phones at George Brown College*. Contact North/Contact Nord. Retrieved from http://contactnorth.ca/sites/default/files/contactNorth/files/pdf/innovation-practices/mobile-assisted_language_learning_-_enhancing_student_learning_with_mobile_phones_at_george_brown_college.pdf

Papadima Sophocleous, S., Georgiadou, O., & Mallouris, Y. (2012). iPod impact on oral reading fluency of university ESAP students. *Proceedings of GloCALL 2012 Conference 2012 International Symposium on CALL, Abstracts and Short Papers* (CD-ROM). Beijing: China.

Papagno, C., & Vallar, G. (1995). Short-term memory and vocabulary learning in polyglots. *Quarterly Journal of Experimental Psychology*, *48*A, 98-107.

Parsons, D., Ryu, H., & Cranshaw, M. (2007). A design requirements framework for mobile learning environments. *Journal of Computers*, *2*(4), 1-8.

Pigada, M., & Schmitt, N. (2006). Vocabulary acquisition from extensive reading: A case study. *Reading in a Foreign Language*, *18*(1), 1-28.

Pinkwart, N., Hoppe, H.U., Milrad, M., & Perez, J. (2003). Educational scenarios for cooperative use of personal digital assistants (PDAs). *Journal of Computer Assisted Learning*, *19*(3), 383-391.

Plass, J. L., Chun, D. M., Mayer, R. E., & Leutner, D. (1998). Supporting visual and verbal learning preferences in a second-language multimedia learning environment. *Journal of Educational Psychology*, *90*(1), 25-36.

Plass, J. L., Chun, D. M., Mayer, R. E., & Leutner, D. (2003). Cognitive load in reading a foreign language text with multimedia aids and the influence of verbal and spatial abilities. *Computers in Human Behavior*, *19*, 221-243.

Plass, J. L., & Jones, L. C. (2005). Multimedia learning in second language acquisition. In R. E. Mayer (Ed.), *The Cambridge handbook of multimedia learning* (pp. 467-488). New York: Cambridge University Press.

Pouwels, J. B. (1992). The effectiveness of vocabulary visual aids for auditory and visual foreign language students. *Foreign Language Annals*, *25*(5), 391-401. doi:10.1111/j.1944-9720.1992.tb01119.x

Pujolà, J.-T. (2002). CALLing for help: Researching language learning strategies using helpfacilities in a web-based multimedia program. *ReCALL*, *14*(2), 235-262.

Purdy, M. (1997). What is listening? In M. Purdy & D. Borisoff (Eds.), *Listening in everyday life: A personal and professional approach* (2nd ed.) (pp. 1-20). Lanham, MD: University Press of America.

Quinn, C. (2000). mLearning: Mobile, wireless, in your pocket learning. *LineZine, Fall 2000*. Retrieved from http://www.linezine.com/2.1/features/cqmmwiyp.htm

Quinn, C. (2013). A future for m-learning. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 82-94). New York: Routledge.

Ranson, S., Boothby, J., Mazmanian, P., & Alvanzo, A. (2007). Use of personal digital assistants (PDAs) in reflection on learning and practice. *Journal of Continuting Education in the Health Professions*, *27*(4), 227-233.

Read, J. (2004). Research in teaching vocabulary. *Annual Review of Applied Linguistics*, *24*, 146-161.

Reinders, H., & Cho, M-Y. (2010). Extensive listening practice and input enhancement using mobile phones: Encouraging out-of-class learning with mobile phones. *TESL-EJ*, *14*(2), 1-7. Retrieved from http://www.tesl-ej.org/wordpress/issues/volume14/ej54/ej54m2/

Reinders, H., & Hubbard, P. (2013). CALL and learner autonomy: Affordances and constraints. In M. Thomas, H. Reinders, & M. Warschauer (Eds.), *Contemporary computer sssisted language learning* (pp. 359-376). London: Continuum Books. Retrieved from http://www.innovationinteaching.org/docs/chapter%20-%202012%20-Reinders%20and%20Hubbard.pdf

Richards, J. C. (1983). Listening comprehension: Approach, design, procedure. In M. H. Long & J. C. Richards (Eds.), *Methodology in TESOL* (pp. 161-176). Rowley, MA: Newbury House.

Riding, R. J., & Cheema, I. (1991). Cognitive styles: An overview and integration. *Educational Psychology*, *11*(3&4), 193-215.

Rieder, A. (2003). Implicit and explicit learning in incidental vocabulary acquisition. *Views*, *12*(2), 24-39.

Roby, W. (1999). What's in a gloss? *Language Learning and Technology*, *2*(2), 94-101.

Rosman, P. (2008). M-learning-as a paradigm of new forms in education. *E+M Ekonomie a Management*, *11*(1), 119-125.

Ross, S. (1997). An introspective analysis of listener inferencing on a second language listening test. In G. Kasper and E. Kellerman (Eds.), *Communication strategies* (pp. 216-237). London: Longman.

Ross, S., & Rost, M. (1991). Learner use of strategies in interaction: Typology and teachability. *Language Learning*, *41*, 235-73.

Rost, M. (1994). *Introducing listening*. London: Penguin Group.

Rost, M. (2002). Listening tasks and language acquisition. *Proceedings of JALT2002 at Shizuoka, Japan* (pp. 18-28). Retrieved from http://jalt-publications.org/archive/proceedings/2002/018.pdf

Rost, M. (2002). *Teaching and researching listening*. London, UK: Longman.

Rott, S., & Williams, J. (2003). Making form-meaning connections while reading: A qualitative analysis of the effect of input and output tasks on word learning. *Reading in a Foreign Language*, *15*, 45-74.

Rott, S. (1999). The effect of exposure frequency on intermediate language learners' incidental vocabulary acquisition through reading. *Studies in Second Language Acquisition*, *21*(4), 589-619.

Rott, S. (2005). Processing glosses: A qualitative exploration of how form-meaning connections are established and strengthened. *Reading in a Foreign Language*, *17*(2), 95-124.

Rott, S. (2007). The effect of frequency of input-enhancements on word learning and text comprehension. *Language Learning*, *57*(2), 165-199.

Roussel, S. (2011). A computer assisted method to track listening strategies in second language learning. *ReCALL*, *23*(2), 98-116. doi:10.1017/S0958344011000036.

Roussel, S., Rieussec, A., & Tricot, A. (2006, June). *L'effet de l'autorégulation matérielle de l'écoute sur la compréhension en classe de langue. Compte-rendu*

d'expérimentation. Paper presented at JETCSIC'2006, Paris. Retrieved from http://psycognitive.u-paris10.fr/jetcsic2006/roussel.pdf

Ruan, G., & Wang, J. (2008). Design of English learning system based on mobile technology. *Proceedings of International Conference on Computer Science and Software Engineering* (pp. 1062-1065). Los Alamitos, CA: IEEE Computer Society.

Rubin, J. (1975). What the "good language learner" can teach us. *TESOL Quarterly*, *9*(1), 41-51.

Rubin, J. (1994). A review of second language listening comprehension research. *The Modern Language Journal*, *78*(2), 199-211.

Sadeghi. K., & Ahmadi, N. (2012). The effect of gloss type and mode on Iranian EFL learners' reading comprehension. *English Language Teaching*, *5*(12), 100-110.

Salvia, J., & Hughes, C. (1990). *Curriculum-based assessment: Testing what is taught*. New York: MacMillan.

Saran, M., Seferoğlu, G., & Çağıltay, K. (2009). Mobile-assisted language learning: English pronunciation at learners' fingertips. *Eurasian Journal of Educational Research*, *34*, 97-114.

Scarcella, R. C., & Oxford, R. L. (1992). *The tapestry of language learning: The individual in the communicative classroom*. Boston: Heinle & Heinle.

Scheiter, K., & Gerjets, P. (2007). Learner control in hypermedia environments. *Educational Psychology Review*, *19*, 285-307.

Schmidt, R. (1990). The role of consciousness in second language learning. *Applied Linguistics*, *11*, 129-158.

Schmidt, R. (1993). Awareness and second language acquisition. *Annual Review of Applied Linguistics*, *13*, 206-226.

Schmidt, R. (1994). Implicit learning and the cognitive unconscious: Of artificial grammars and SLA. In N. Ellis (Ed.), *Implicit and explicit learning of languages* (pp. 165-209). London: Academic Press.

Schmidt, R. (2001). Attention. In P. Robinson (Ed.), *Cognition and second language instruction* (pp. 3-32). Cambridge: Cambridge University Press.

Schmitt, N. (2000). *Vocabulary in language teaching*. New York: Cambridge University Press.

Schmitt, N. (2008). Instructed second language vocabulary learning. *Language Teaching Research*, *12*(3), 329-363.

Seppala, P., & Alamaki, H. (2003). Mobile learning in teacher training. *Journal of Computer Assisted Learning*, *19*(3), 330-335.

Shahrokni, A. (2009). Second language incidental vocabulary learning: The effect of online textual, pictorial, and textual pictorial glosses. *Teaching English as a Second or Foreign Language*, *13*(3), 1-17.

Shalmani, H. B., & Sabet, M. K. (2010). Pictorial, textual, and picto-textual glosses in E-reading: A comparative study. *English Language Teaching*, *3*(4), 195-203.

Sharples, M. (2009). Methods for evaluating mobile learning. In G. N. Vavoula, N. Pachler, & A. Kukulska-Hulme (Eds.), *Researching mobile learning: Frameworks, tools and research designs* (pp. 17-39). Oxford: Peter Lang Publishing Group.

Sharples, M., Crook, C., Jones, I., Kay, D., Chowcat, I., Balmer, K., & Stokes, E. (2009). *New modes of technology-enhanced learning: Opportunities and challenges: First-term report*. Retrieved from http://www.sero.co.uk/assets/capital/ht_new_modes_opps_challenges.pdf

Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The sage handbook of e-learning Research* (pp. 221-247). London: Sage.

Shu, H., Anderson, R. C., & Zhang, H. (1995). Incidental learning of word meanings while reading: A Chinese and American cross-cultural study. *Reading Research Quarterly*, *30*(1), 76-95.

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, *2*(1), 3-10. Retrieved from http://www.itdl.org/Journal/Jan_05/article01.htm

Smidt, E., & Hegelheimer, V. (2004). Effects of online academic lectures on ESL listening comprehension, incidental vocabulary acquisition, and strategy use. *Computer Assisted Language Learning*, *17*(5), 525-564.

Song, Y. (2008). SMS enhanced vocabulary learning for mobile audiences. *International Journal of Mobile Learning and Organisation*, *2*(1), 81-98. Retrieved from http://dl.acm.org/citation.cfm?id=1380536

Song, Y., & Fox, R. (2008). Using PDA for undergraduate student incidental vocabulary testing. *ReCALL*, *20*(3), 290-314.

Stockwell, G. (2008). Investigating learner preparedness for and usage patterns of mobile learning. *ReCALL*, *20*(3), 253-270.

Stockwell, G. (2010). Using mobile phones for vocabulary activities: Examining the effect of the platform. *Language Learning & Technology*, *14*(2), 95-110.

Stockwell, G., & Hubbard, P. (2013). *Some emerging principles for mobile-assisted language learning*. Monterey, CA: The International Research Foundation for English Language Education. Retrieved from http://www.tirfonline.org/english-in-the-workforce/mobile-assisted-language-learning

Stoehr, L. E. (1999). *The effects of built-in comprehension aids in a CALL program on student-readers' understanding of a foreign language* (Unpublished doctoral dissertation). University of Texas at Austin: Austin, TX.

Summey, D. (2013). Mobile learning strategies for K-12 professional development. In Z. Berge & L. Muilenburg (Eds.), *Handbook of mobile education* (pp. 447-457). Newyork: Routlegde.

Sweller, J. (1994). Cognitive load theory, learning difficulty and instructional design. *Learning and Instruction*, *4*, 295-312.

Sweller, J., & Chandler, P. (1991). Evidence for cognitive load theory. *Cognition and Instruction, 8*(4), 351-362.

Sydorenko, T. (2010). Modality of input and vocabulary acquisition. *Language Learning & Technology*, *14*(2), 50-73.

Şakar, A. & Erçetin, G. (2005). Effectiveness of hypermedia annotations for foreign language reading. *Journal of Computer Assisted Learning*, *21*(1), 28-38.

Tabatabaei, O., & Mirzaei, M. (2014). Comprehension and idiom learning of Iranian EFL learners. *Journal of Educational and Social Research*, *4*(1), 45-56.

Taylor, A. M. (2006). The effects of CALL versus traditional L1 glosses on L2 reading comprehension. *CALICO Journal*, *23*, 309-318.

Taylor, A. M. (2009). CALL-based versus paper-based glosses: Is there a difference in reading comprehension? *CALICO Journal*, *27*(1), 147-160.

Thompson, I., & Rubin, J. (1996). Can strategy instruction improve listening comprehension? *Foreign Language Annals*, *29*(3), 331-342.

Thornton, P. & Houser, C. (2005). Using mobile phones in English education in Japan. *Journal of Computer Assisted Learning*, *21*(3), 217-228.

Traxler, J. (2005). Mobile learning- it's here but what is it? *Interactions Journal*, *9*(1), 1-12. Retrieved from http://www2.warwick.ac.uk/services/ldc/resource/interactions/issues/issue25/traxler

Traxler, J. (2007). Defining, discussing and evaluating mobile education. *International Review of Research in Open and Distance Learning*, *8*(2). Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/346

Traxler, J. (2009). Learning in a mobile age. *International Journal of Mobile and Blended Learning*, *1*(1), 1-12.

Tuttle, G. H. (2013). Improving student's modern language speaking skills through mobile learning. In Z. L. Berge & L. Y. Muilenburg (Eds.), *Handbook of mobile learning* (pp. 112-118). New York: Routledge.

Türk, E., & Erçetin, G. (2014). Effects of interactive versus simultaneous display of multimedia glosses on L2 reading comprehension and incidental vocabulary learning. *Computer Assisted Language Learning*, *27*(1), 1-25. doi:10.1080/09588221.2012.692384

van Zeeland, H., & Schmitt, N. (2013). Incidental vocabulary acquisition through L2 listening: A dimensions approach. *System*, *41*(3), 609-624.

Vandergrift, L. (1997). The strategies of second language (French) listeners: A descriptive study. *Foreign Language Annals*, *30*, 387-409.

Vandergrift, L. (1998). Successful and less successful learners in French: What are the strategy differences? *The French Review*, *71*(3), 370-395. Retrieved from http://www.jstor.org/stable/10.2307/398969

Vandergrift, L. (1999). Facilitating second language listening comprehension: Acquiring successful strategies. *ELT Journal*, *53*(3), 168-176.

Vandergrift, L. (2003). From prediction through reflection: Guiding students through the process of L2 listening. *Canadian Modern Language Review*, *59*(4), 425-440.

Vandergrift, L. (2004). Listening to learn or learning to listen? *Annual Review of Applied Linguistics*, *24*(1), 3-25.

Vandergrift, L. (2007). Recent developments in second and foreign language listening comprehension research. *Language Teaching*, *40*(3), 191-210.

Vandergrift, L. (2010). Researching listening in applied linguistics. In B. Paltridge & A. Phakiti (Eds.), *Companion to research methods in applied linguistics* (pp. 160-173). London: Continuum.

Vandergrift, L. (2011). Listening: theory and practice in modern foreign language competence. *Centre for Languages, Linguistics and Area Studies*. Retrieved from https://www.llas.ac.uk/resources/gpg/67

Vandergrift, L., & Goh, C. (2012). *Teaching and learning second language listening: Metacognition in action*. New York: Routledge.

Vandergrift, L., Goh, C. C. M., Mareschal, C. J., & Tafaghodtari, M. H. (2006). The metacognitive awareness listening duestionnaire: Development and validation. *Language Learning*, *56*(3), 431-462.

Vavoula, G. N., & Sharples, M. (2002). KLeOS: A personal, mobile, knowledge and learning organisation system. In M. Milrad, U. Hoppe, & Y. Kinshuk (Eds.), *Proceedings of the IEEE International Workshop on Mobile and Wireless Technologies in Education (WMTE2002)* (pp. 152-156). Vaxjo, Sweden: IEEE Computer Society.

Vidal, K. (2011). A comparison of the effects of reading and listening on incidental vocabulary acquisition. *Language Learning*, *61*(1), 219-258.

Vogely, A. J. (1998). Listening comprehension anxiety: students reported sources and solutions. *Foreign Language Annals*, *31*, 67-80.

Waring, R., & Nation, I. S. P. (2004). Second language reading and incidental vocabulary learning. *Angles on the English Speaking World*, *4*, 97-110.

Waring, R., & Takaki, M. (2003). At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language*, *15*(2), 130-163.

Watanabe, Y. (1997). Input, intake, and retention: Effects of increased processing on incidental learning of foreign language vocabulary. *Studies in Second Language Acquisition*, *19*(3), 287-307.

Webb, S. (2007). The effects of repetition on vocabulary knowledge. *Applied Linguistics*, *28*(1), 46-65.

Wells, G. (1986). *The meaning makers: Children learning language and using language to learn*. Portsmouth, NH: Heinemann.

Winke, P., Gass, S. M., & Sydorenko, T. (2010). The effects of captioning videos used for foreign language listening activities. *Language Learning & Technology*, *14*(1), 66-87.

Wong, L. H., & Looi, C. K. (2010). Vocabulary learning by mobile-assisted authentic content creation and social meaning making: Two case studies. *Journal of Computer Assisted Learning*, *26*(5), 421-433.

Yanguas, I. (2009). Multimedia glosses and their effect on L2 text comprehension and vocabulary learning. *Language Learning and Technology*, *13*(2), 48-67.

Yeh, S. W., & Lehman, J. D. (2001). Effects of learner control and learning strategies of EFL learning form interactive hypermedia lessons. *Journal of Educational Multimedia and Hypermedia*, *10*(2), 141-159.

Yeh, Y., & Wang, C. (2003). Effects of multimedia vocabulary annotations and learning styles on vocabulary learning. *CALICO Journal*, *21*(1), 131-144.

Yıldız, S. (2012, June). *Use of iPad applications to introduce English as a foreign language to young Turkish learners*. Paper presented at 2012 CALICO Symposium, University of Notre Dame, South Bend, Indiana.

Yoshii, M. (2006). L1 and L2 glosses: their effects on incidental vocabulary learning. *Language Learning and Technology*, *10*(3), 85-101.

Yoshii, M. (2013). Effects of gloss types on vocabulary learning through reading: Comparison of single translation and multiple-choice gloss types. In P. Hubbard, M. Schulze, & B. Smith (Eds.), *Learner-computer interaction language education: A festschrift in honor of Robert Fischer* (pp. 203-229). San Marcos, TX: Computer Assisted Language Consortium (CALICO). Retrieved from http://journals.sfu.ca/CALICO/index.php/calico/article/view/133

Yoshii, M., & Flaitz, J. (2002). Second language incidental vocabulary retention: The effect of text and picture annotation types. *CALICO Journal*, *20*(1), 33-58.

Yun, J. (2011). The effects of hypertext glosses on L2 vocabulary acquisition: A meta-analysis. *Computer Assisted Language Learning*, *24*(1), 39-58.

Zahar, R., Cobb, T., & Spada, N. (2001). Acquiring vocabulary through reading: Effects of frequency and contextual richness. *The Canadian Modern Language Review*, *57*(3), 541-572.

Zarei, A. A., & Mahmoodzadeh, P. (2014). The effect of multimedia glosses on L2 reading comprehension and vocabulary production. *Journal of English Language and Literature*, *1*(1), 1-7.

Zhang, F. (2012). Combining the body and mobile technology to teach English pronunciation. In F. Zhang (Ed.), *Computer-enhanced and mobile-assisted language learning: Emerging issues and trends* (pp. 202-219). Hershey, PA: IGI Global. Retrieved from http://www.igi-global.com/chapter/combining-body-mobile-technology-teach/58776

Zhang, H., Song, W., & Burston, J. (2011). Reexamining the effectiveness of vocabulary learning via mobile phones. *Turkish Online Journal on Educational Technology*, *10*(3), 203-214. Retrieved from http://files.eric.ed.gov/fulltext/EJ944968.pdf

Zhao, Y. (1997). The effects of listeners' control of speech rate on second language comprehension. *Applied Linguistics*, *18*(1), 49-68.

Zhao, Y. (2005). The future of research in technology and second language education. In Y. Zhao (Ed.), *Research in technology and second language learning: Developments and directions* (pp. 445-457). Greenwich, CT: Information Age Publishing, Inc.

Zurita G., & Nussbaum, M. (2004). A constructivist mobile learning environment supported by a wireless handheld network. *Journal of Computer Assisted Learning*, *20*, 235-243.