INVESTIGATING THE IMPACTS OF MEDIATED GLOSSES ON READING COMPREHENSION AND VOCABULARY LEARNING IN FOREIGN LANGUAGE

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ÇOKLU ORTAM AÇIKLAMALARININ YABANCI DİLDE OKUDUĞUNU ANLAMA VE KELİME ÖĞRENME ÜZERİNE ETKİLERİNİN İNCELENMESİ

(Investigating the Impacts of Mediated Glosses on Reading Comprehension and Vocabulary Learning in Foreign Language)

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KABUL VE ONAY TUTANAĞI

Eda YUCA tarafından hazırlanan "Çoklu Ortam Açıklamalarının Yabancı Dilde Okuduğunu Anlama ve Kelime Öğrenme Üzerine Etkilerinin İncelenmesi" başlıklı çalışması 18/04/2019 tarihinde yapılan tez savunma sınavı sonucunda başarılı bulunarak jürimiz tarafından Yabancı Diller Eğitimi Ana Bilim Dalı, İngiliz Dili Eğitimi Bilim Dalında Doktora tezi olarak kabul edilmiştir.

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ÖZ

DOKTORA TEZİ

ÇOKLU ORTAM AÇIKLAMALARININ YABANCI DİLDE OKUDUĞUNU ANLAMA VE KELİME ÖĞRENME ÜZERİNE ETKİLERİNİN İNCELENMESİ

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Amaç. Bu tez çalışması, üç farklı çoklu ortam açıklama türünün metin türünü de hesaba katarak yabancı dil öğrenenlerin okuduğunu anlama ve kelime öğrenmeleri üzerindeki etkilerini incelemiştir.

Yöntem: Bir karma yöntem araştırması olan bu çalışma, 119 ikinci ve üçüncü sınıf İngilizce Öğretmenliği Bölümü öğrencilerinin rastgele üç deney ve bir kontrol grubuna atanmasıyla yürütülmüştür. Deney grupları üç farklı türde sözcük açıklaması almışlardır: sadece yazılı; yazılı ve görsel; yazılı, görsel ve sesli açıklamalar. Katılımcılar, üç farklı türde metni gruplarına uygun şartlar altında bilgisayar ortamında çevrimiçi olarak okumuş ve uygulamalardan sonra her bir metne yönelik okuduğunu anlama ve sözcük bilgisi testini cevaplamışlardır. Katılımcıların çevrimiçi sözcük açıklamalarına yönelik tutumları bir anketle ölçülmüştür. Katılımcıların uygulama ile alakalı görüşleri, algıları ve deneyimleri ise geri-dönüt anketi ve yarı yapılandırılmış görüşmelerle değerlendirilmiştir. Nicel veriler tanımlayıcı istatistik, varyans analizi, t-test ve korelasyon analizi yordamıyla incelenirken, görüşme verileri içerik analizine tabi tutulmuştur.

Bulgular: Çoklu ortam açıklamaları arasında, yazılı, görsel ve sesli açıklamaların birlikte kullanımının yazılı ve görsel açıklama ya da sadece yazılı açıklamaya kıyasla okuduğunu anlama başarısında daha etkili olduğu tespit edilmiştir. Sözcük bilgisi açısından yazılı, görsel ve işitsel açıklamaların birlikte kullanıldığı grup, diğer deney gruplarından istatistiksel olarak daha başarılı bulunmuştur. Metin türü bağlamında ise sonuçlar sözcük açıklamalarıyla desteklenmiş öyküleyici metnin, açıklayıcı metin türlerine göre daha fazla anlaşıldığını gösterirken, sözcük hatırlama bağlamında metin türleri arasında bütün gruplar için geçerli olan anlamlı bir farklılık bulunmamıştır. Çevrimiçi açıklamalara karşı katılımcıların olumlu tutumlara sahip oldukları görülmüştür.

Sonuç: Sözcük açıklama tekniği, yabancı dilde okuduğunu anlama ve sözcük kazanımı üzerinde olumlu etkilere sahiptir.

Anahtar Kelimeler: sözcük açıklaması, çoklu ortam öğrenme, kelime öğrenme, okuduğunu anlama.

ABSTRACT

DOCTORAL DISSERTATION

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Purpose: This dissertation explored the impacts of three combinations of mediated glosses along with text type on the enhancement of reading comprehension and vocabulary development of foreign language learners.

Method: Adopting a mixed methods research, this study was conducted on 119 sophomore and junior ELT students randomly assigned to three treatment groups receiving textual, the combination of textual and pictorial or the combination of textual, pictorial and audio glosses as well as one control group. The participants read three texts with various types and answered three reading comprehension and vocabulary tests online at the end of the treatment. Their attitudes towards online glosses were measured with a questionnaire. The participants' opinions about the treatment were examined through a feedback questionnaire and semi-structured interviews. The analyses of quantitative data were carried out through descriptive statistics, ANOVA, t-tests, correlation analysis whereas content analysis was adopted for interview data.

Results: The combination of textual, pictorial and audio glossing was significantly more effective on the participants' reading comprehension than the combination of textual and pictorial glossing, and single textual glossing. The combination of textual, pictorial and audio glossing was statistically more effective than textual+ pictorial glossing and textual glossing on the participants' vocabulary learning. The narrative glossed text was comprehended better than glossed expository texts whereas there was no significant difference for word retention in all glossing conditions. The participants in experimental groups had positive attitudes towards online glosses.

Conclusion: Glossing has positive impacts on reading comprehension and vocabulary learning in a foreign language.

Keywords: gloss, multimedia learning, vocabulary learning, reading comprehension

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ABBREVIATIONS

B. A. **:** Bachelor of Arts

CALL **:** Computer Assisted Language Learning

CTML **:** Cognitive Theory of Multimedia Learning

EFL **:** English as a Foreign Language

ELT **:** English Language Teaching

ESL **:** English as a Second Language

L1 **:** First Language

L2 **:** Second/ Foreign Language

N **:** Number of Participants

PhD **:** Doctor of Philosophy

Q **:** Question

SPSS **:** Statistical Package for the Social Sciences

CHAPTER ONE

Introduction

Background of the Study

As the essential building block of language, vocabulary has a critical and significant role in foreign or second language learning and teaching. Vocabulary acquisition is considered as the most important dimension of second-language learning by many researchers (Knight, 1994). In order to learn a second language and be proficient in all aspects of a language including listening, reading, writing and speaking, learners need to have a large number of word knowledge, and the lack of that knowledge causes difficulties in using and understanding language (Geva & Clifton, 1994; Jimenez, Garcia & Pearson, 1996; Kim, 1995; Lomicka, 1998). Therefore, how to improve and enhance vocabulary learning, and how to use vocabulary effectively have been major concerns of second language learners, teachers and researchers.

Vocabulary learning generally occurs incidentally while learners are dealing with other cognitive activities as suggested by second language learning researchers (Hulstijn & Laufer, 2001; Krashen, 1989; Wesche & Paripakht, 1999). Among these cognitive activities researchers have paid great attention to reading. For instance, Huckin and Coady (1999, p. 182) have expressed that "except for the first few thousand most common words, vocabulary learning dominantly occurs through extensive reading". Besides, Nation (2001) has indicated that language learners' vocabulary and language competence can enhance through reading habits. Similarly, Hunt and Berglar (1998) have asserted that incidental vocabulary learning is an important aspect of learning vocabulary, and through extensive reading language learners are provided with rich contexts that contribute to vocabulary learning. Therefore, the significant relationship between incidental vocabulary learning and reading is undeniable as also supported by second language research.

Second language learning researchers (Anderson & Freebody, 1981; Markham, 1989; Segalowitz *et al*., 1995) have also revealed that vocabulary is of the utmost importance in the development of high level of reading ability and reading comprehension. While vocabulary is acquired incidentally through extensive reading, reading comprehension is achieved through vocabulary knowledge. Learners need to have a certain amount of vocabulary to be able to understand a reading text. Stahl (1983, p. 33) has emphasized the relationship between

reading comprehension and vocabulary knowledge as "one of the best documented relationships in reading research".

For enhancing vocabulary learning and reading comprehension, English as Foreign Language learners generally use a variety of strategies to memorize new words. They try to learn vocabulary through word lists presented with their translations in L1 (first language), or use dictionaries and glosses. However, learners tend to forget the newly memorized words with word lists in a short time or they cannot use these words in speaking, writing or reading efficiently since these words are learned directly and out of context. As a common strategy adopted by L2 learners, checking dictionary while reading can also be distractive especially if the number of unknown words is high because frequent looking up dictionary takes too much time and interrupts the process of reading. In addition, a word may have several meanings in a dictionary, which in turn, makes it difficult for learners to choose the appropriate meaning (Nation, 2001) and most of the time learners confront with more difficult words in the dictionary definition which makes the situation more confusing (Stahl, 2003).

On the other hand, vocabulary learning becomes much easier and more time saving with the use of a gloss which is defined as "a translation or brief explanation of difficult or technical words" by Xu Hong (2010) and regarded as "a substitute for dictionary" (Yanguas, 2009) since through glossing definitions of the words are presented in the reading text and learners can refer to the target word and gloss frequently. According to Ko (2012), glossing is an effective way of making words salient, and facilitating vocabulary learning and reading comprehension. Koren (1999) has also suggested that glossing is the easiest way to learn new words in context. Glosses raise consciousness by motivating foreign language learners to notice and refer to target words (Nagata, 1999), which supports Schmidt's (1995) Noticing Theory proposing that 'conscious attention' is fundamental for learning, and the first stage of learning is 'noticing',

Giving L1 or L2 definition of words in glosses is a traditional way (Chun & Plass, 1996a). With the increasing use of technology in education and incorporation of computers and multimedia programs in language learning, Computer Assisted Language Learning (CALL) has emerged (Hong, 2010). As a powerful method for promoting learners' interest and motivation (Hong, 2010), CALL has led glosses also to be in the form of computer-based and multimedia. In this regard, recently there is a tendency to form and use electronic or multimedia glosses that contain not only texts but also pictures, sound and videos to facilitate vocabulary learning and reading comprehension in second language learning and teaching field. This new multimedia type of glossing has attracted the interest of researchers searching

for answers whether the acquisition of L2 vocabulary and L2 reading comprehension will be enhanced through the use of multimedia.

The use of different media types in glosses and multimedia instruction are cognitively based on two major and significant theories: namely dual coding theory and generative theory. The former theory (Clark & Paivio, 1991) claims that cognitive processing takes place in two channels (verbal and nonverbal), and the process of learning is more enhanced when the two channels are used simultaneously. The latter one asserts that (Wittrock, 1974, cited in Mayer, 1997) there are multiple forms for information to be presented, and learners are 'knowledge constructors' who can choose and connect appropriate form of information (visual and verbal) to construct meaning. Both theories support the assistance and benefit of multimedia glosses which are the combinations of different forms of media in a gloss.

The positive role and effectiveness of hypertext glosses are confirmed by various studies (Akbulut, 2007; Al-Seghayer, 2001; Chun & Plass, 1996a; Farvardin & Biria, 2012; Hong, 2010; Ko, 2005; Lomicka, 1998; Yoshii, 2006). However, the question of whether vocabulary learning and reading comprehension are more promoted when the meanings of glossed words are given in a single form (textual) or in different combinations of multimedia features (e.g. picture, video, sound, animation etc.), still remains unanswered because the results of many related research investigating the effects of different types of multimedia glosses are relatively inconsistent and inconclusive (Türk & Erçetin, 2014). For instance, Chun and Plass (1996a, 1996b, and 1997) have examined how two combinations of gloss (text-picture gloss vs text-video gloss) influence the vocabulary gains of English learners of German, and they found that the group receiving both pictorial and textual gloss had better scores on vocabulary retention tests than the group with the treatment of text-video gloss. In contrast, another study by Al-Seghayer (2001) in which participants were assigned to three different gloss groups (textual and pictorial, textual and audio, textual and video) has suggested that the words glossed with text and video were recalled better than words glossed with text and picture. The results of these two studies are opposite and inconsistent.

Moreover, some studies investigated the impact of hypermedia glosses on only vocabulary learning whereas some others examined their effect on reading comprehension. The results of the latter are somewhat contradictory as well. Measuring the effects of textual, pictorial, textual+ pictorial glosses on reading comprehension, Yanguas (2009) found that textual+ pictorial gloss group outperformed significantly on reading comprehension than the other two groups. Yet, Akbulut (2007) and Zarei and Mahmoodzadeh (2014) reported no

significant differences between text-only groups vs text-visual groups on reading comprehension.

The above-mentioned studies with their relatively contradictory results and other related studies indicate that there is still a demanding need for empirical research to investigate the effects of hypermedia glossing on reading comprehension and vocabulary learning with L2 readers (Al Ghafli, 2011; Ben Salem, 2006; Zarei & Mahmoodzadeh, 2014). Although researchers have examined various combinations of media glosses, the results are still inconsistent, inconclusive and mixed. Especially in Turkish context there are few studies (Akbulut, 2007; Sakar & Erçetin, 2005) that have investigated the effectiveness of multimedia annotations on reading comprehension and vocabulary learning, hence more research is needed in this field. As an attempt to fill this gap in the literature the current study aims to examine the impact of different combinations of multimedia glosses on vocabulary learning and reading comprehension of upper-intermediate Turkish EFL learners.

Purpose of the Study

The goal of this dissertation is to explore whether reading comprehension and vocabulary learning of EFL learners can be enhanced with the use of three different mediated gloss types. Additionally, it also aims to determine whether there is any significant effect of different texts with multimedia glosses on reading comprehension as well as vocabulary learning performances of upper-intermediate learners of English. The mediated gloss types to be investigated include three combinations:

a. textual (L1 equivalent of glossed word, L2 definition and an example sentence in L2)
b. textual and pictorial (L1 equivalent, L2 definition, an example sentence in L2, and a picture)
c. textual, pictorial and audio (L1 equivalent, L2 definition, an example sentence in L2, a picture and the pronunciation of the glossed word and its definition.)

The present study particularly seeks to address the question whether certain combinations of mediated glosses are more effective in promoting the reading comprehension and vocabulary learning of English language learners in Turkey.

Significance of the Study

This dissertation aims to contribute to foreign language learning research in understanding the effectiveness of different kinds of glosses enriched with multimedia features in L2 vocabulary learning and L2 comprehension of reading texts. As mentioned in the introduction and literature review sections, the research on which combination of

multimedia glosses are more effective for vocabulary learning and reading comprehension has confusing and mixed results. Thus, there is a demanding need for further research in this context to render these results clearer and more understandable. Additionally, in today's world the rapid advances in technology lead to extensive increase in the number of L2 learners reading electronic texts through internet. This situation necessitates designers developing new and the best ways of presenting texts with glosses. Therefore, designers need to be guided by researchers about which combination of multimedia gloss would be the most effective one. The current dissertation is an attempt to serve this purpose with three combinations of multimedia gloss.

The previous studies generally have used only one text and assessed the participants' performances according to that very text. The participants may not be interested in that text topic or may not be familiar with the genre of this text. Although there are numerous studies attempting to explain glosses and their effects on vocabulary learning and reading comprehension, it is hard to come across a study that explore the influence of glosses in various types of texts (Far, 2016). This situation might have influence on the findings of the previous studies. In this sense, this study considers the effect of text type in multimedia gloss studies. With three different text types: (i) a narrative story, (ii) a non-scholarly article and (iii) a biography glossed with L1 and L2 definitions, pictures and audio recordings, this dissertation aims to add another dimension to the literature.

On the other hand, there are only few studies that take into consideration the effect of sound into multimedia glosses whereas the impact of auditory stimuli has not been studied comprehensively (Gasigijtamrong, 2013). The studies that investigated this effect (Al Ghafli, 2011; Ben Salem, 2006; Ben Salem & Aust, 2007; Yeh & Wang, 2003) contained only the pronunciation of the target vocabulary, which provides limited auditory stimuli. However, different from the previous studies, the current study includes not only the pronunciation of target words but also the L2 definitions of the target words sounded out by native speakers, and these audio recordings have been integrated into the glosses. In this way, more auditory information has been presented to the participants, and thus the effect of these audio recordings in comparison with other multimedia glosses on reading comprehension and vocabulary retention of the learners have been investigated thoroughly and clearly.

In conclusion, the combination of gloss types, the use of three different reading texts with various types, and the integration of audio recordings of the definitions into glosses make this study unique as well as significant in the investigation of the effects of the multimedia glosses on both reading comprehension and vocabulary learning of Turkish EFL

learners. The results of this study will be useful and valuable for foreign language teachers who search new ways of teaching vocabulary and presenting reading materials; foreign language learners who have difficulty to learn vocabulary; researchers interested in vocabulary teaching and reading skills, and material designers in developing useful and suitable reading materials integrated with various types of glossing for difficult, abstract and target words to facilitate vocabulary learning and reading comprehension.

Definitions of Terms

Annotation/ Gloss: It is a brief explanation, definition or synonym either in an L1 or L2 presented for an L2 word in a reading material. In literature, these two terms are used interchangeably.

Computer Assisted Language Learning: It is the study of using a wide range of computer applications and approaches for language learning and teaching process.

Hypertext: An electronic reading text that can be accessed in a non-linear way through hyperlinks (Ben Salem, 2006).

Hypermedia: It is a term used for the applications including both hypertext and multimedia features in a software.

Incidental Vocabulary Learning: It refers to the process of learning vocabulary unintentionally while reading or listening in a second language.

L1: It is used for the first or native language of a learner. The L1 of the participants is Turkish in this study.

L2: It is used for the second language of a learner. The L2 of the participants is English in this study.

Learning style: It is a way or approach of learning preferred by a learner to comprehend, process and retain information.

Multimedia: It is a term used for computer-based applications displaying information in the form of text, dynamic/static picture, audio, video, graphics and movie.

Multimedia/mediated gloss: It is a type of annotation that includes information in multiple forms such as text, sound, picture, video and graphic.

Textual annotation/gloss/glossing: It is a type of annotation that presents information for the target word in the form of words without any pictures, sounds or videos

Pictorial annotation/gloss/glossing: It is a type of gloss that presents information in the form of pictures, illustrations only to depict the meaning of target words.

Audio gloss/annotation/glossing: It is a type of annotation that provides information for the target word in the form of sound.

Textual+ pictorial gloss: It is used for the glosses that combine both textual and pictorial inputs to clarify the meaning of the unknown words.

Textual+ pictorial+ audio gloss: It is a multimedia gloss that includes textual, pictorial and audio information at the same time for an unknown word.

Reading Comprehension: It is measured by the participants' performance on three different reading tests given in the study.

Vocabulary Learning: It is measured by the participants' performance on a vocabulary test in the present study.

Vocabulary/Word Retention: It refers to the ability to keep vocabulary in long term memory and retrieve it after a period of time. The vocabulary retention measure in the current study is two weeks after the intervention. It is measured by the participants' performance on the vocabulary test two weeks later.

Organization of the Study

This dissertation is organized in five chapters. Chapter One presents introductory information about the dissertation such as the background information, the aim and significance of the study and the definitions of key terms used in the study. Chapter Two reviews literature related to the current study. Chapter Three describes the methodology part of the study like research questions, research design, participants, materials and instruments utilized to collect data, and data collection procedures. Reliability and validity issues of data collection instruments are also included in this chapter. Chapter Four presents results of the analyses of the collected data for this study. Chapter Five finally discusses the research findings and concludes with limitations and pedagogical implications of the study as well as suggestions for further research.

CHAPTER TWO

Literature Review

This chapter aims to present the relevant literature as organized in five sections. The first section makes an introduction into CALL and multimedia learning while the second part provides theoretical background of this study including Dual-Coding Theory and Cognitive Theory of Multimedia Learning. The following section discusses the importance of L2 reading with an emphasis on three models of L2 reading: bottom-up, top-down and integrative reading processing, the factors influencing L2 reading process and the relationship between text genre and reading in another language. The fourth section presents research on the significance of L2 vocabulary learning in language learning and teaching, and the two types of vocabulary learning: intentional and incidental vocabulary learning. The last section draws upon glossing and its advantages and types. It reviews the relevant literature about the influence of multimedia glosses on either L2 vocabulary learning or L2 reading comprehension and both on L2 reading comprehension and vocabulary learning.

CALL and Multimedia Learning

Computer- Assisted Language Learning (CALL) has developed with the integration of computer technology into language learning field. In literature the development of CALL and its history are explained based on a classification that includes three stages in the growth of CALL; these are namely behavioristic CALL, communicative CALL and integrative CALL (Warchauer & Healey, 1998). Behavioristic CALL emerging in the 1950s was regarded as ‘mechanical tutor’ that enabled learners to study individually at their speed, and there was explicit instruction on grammar rules whereas communicative CALL was developed in the late 1970s, emphasized communication skills, grammar was taught implicitly, and the focus was on meaning rather than form. In interactive CALL influenced by socio-cognitive approaches, on the other hand, started in the late 1980s, and different skills of language learning were integrated into authentic social contexts (Warchauer & Healey, 1998). In recent years however, CALL has been supported through multimedia tools in the same computerized program.

With the integration of information technology into language learning and teaching process, teachers started to use computers and internet in their classrooms and thus, the way

of instruction changed from teacher or book-centered to student-centered. Recently, the use of CALL has become widespread in different settings for foreign language education purposes all over the world. This situation is the result of information technology's integration of various multimedia features and tools such as text, picture, audio, animation, video, graphics and interaction at the same time to improve four skills required to learn foreign or second language learning (Plass, *et al*. 1998). Today almost all schools have the opportunity to use computers and the internet in education all over the world. With easy and increasing access to computer technology and the internet, teachers and learners have a great amount and variety of opportunities and resources for language teaching and learning. The positive influence of CALL applications on second or foreign language learning process have been reported in many studies (AbuSeileek, 2007; AlKahtani, 1999; Chiu, Liou & Yeh, 2007; Grace, 2000; Griffiths, 2008; Nagata, 1999; Sierra, 1999; Warschauer, 2000). In a meta-analysis carried out by AbuSeileek (2007) indicated that CALL instruction had a positive influence on learners' performance in speaking skills in contrast to traditional way of instruction. In AlKahtani's (1999) study, it was found that CALL increased learners' reading velocity and promoted reading comprehension. Among relevant literature, there is a great amount of studies reporting the advantages of CALL practices in enhancing vocabulary learning as well (Al Ghafli, 2011; Groot, 2000; Huang & Liou, 2007; Kılıçkaya & Krajka, 2010).

The terms multimedia and hypermedia are used interchangeably in the research; however, Beatty (2005, p. 39) makes a very clear and simple distinction between these two terms:

> Multimedia usually refers to many of the same ideas associated with hypermedia, but hypermedia might only make use of two types of media (e.g. text + sound or text + photographs). Multimedia tends to feature several media types including text, images, sound, video and/or animations.

One of the multimedia technology's main functions is to help teachers in the process of teaching. When that technology is used and designed properly, not only it assists teachers but also helps learners by enhancing learning process (Hu, 2001). In second language and foreign language learning, multimedia is a useful, practical and pleasing tool that can be manipulated to promote vocabulary learning and reading comprehension. With multimedia and CALL, learners can take control of their learning process since they can access to thousands of resources via internet. For instance, foreign language learners can learn new vocabulary through texts, online dictionaries, flashcards, pictures, animations, games, power points, videos, puzzles and other materials individually in classroom or at home. There is a variety of resources that can be used for learning process with the integration of multimedia

into computer technology and hence, learning process is realized through active participation of learners.

Multimedia technology has brought many benefits to language learning as mentioned by some researchers (Beatty, 2005; Hoogeven, 1995). One of the benefits of multimedia applications to language learning is that learners' interest is attracted via computers. Computers make reading more entertaining and thus, learners become more enthusiastic to read more and more. Learners' autonomy is also enhanced by multimedia technology because learners can use the links to get more explanations without much control of teachers. With a well-developed multimedia database, they can make search for what they want and be responsible for their learning process. Moreover, multimedia makes the access to information easier and faster. With just one click learners can get the meanings of words they do not know easily and accurately. Learners become concentrated and alert while they are engaged in reaching information and processing it. Furthermore, learners can get information in the form of pictures, animations, sounds, graphics, videos so that they can have the opportunity to get information according to different learning styles. Even some applications make learners respond to multimedia in different ways, which leads learners to experience information actively rather than just memorizing it. Likewise, according to the Generative Theory of Multimedia Learning proposed by Mayer (2009) multimedia learning necessitates the use of cognitive processes such as choosing related information, cognitively systematizing the information into a rational organization, and integrating the new information into the previous knowledge kept in long term memory. This process is a cognitively active process that requires learners to be engaged in information processing.

There are also many studies discussing the benefits of teaching language by using multimedia elements like videos, pictures, text, animation, and graphics in language learning literature (Akbulut, 2007; Al-Seghayer, 2001; Chun & Plass, 1997; Kost et al, 1999). For instance, Sun & Dong (2004) pointed out that multimedia learning gave the opportunity to provide an authentic and engaging language environment that could appeal to multiple senses for language learners. In the same vein, Trinder's study (2002) demonstrated that in English for Business courses, the use of multimedia assisted learners to develop their listening skills with its interactivity feature that made it possible to communicate with native speakers. Multimedia application also helped those learners comprehend spoken language through presented subtitles.

As a result, since the emergence of CALL and multimedia learning, second or foreign language studies have indicated a favorable attitude towards utilizing CALL practices and

multimedia features in promoting all four skills of language learning process. The educational value of computer-assisted learning and multimedia learning has been recognized by a growing number of researchers since 90s. With the rapid change and development of technology language learners and teachers are finding new opportunities to use new practices of CALL for educational purposes. Since there is a remarkable potential in CALL and multimedia learning, second language researchers should follow and study new CALL practices closely and thoroughly. Considering the advantages of CALL and multimedia learning along with the developments in technology, this dissertation attempts to investigate the effects of glosses on reading comprehension and vocabulary learning in a multimedia learning environment. The following section further discusses the theoretical framework of the dissertation, including the Generative Theory of Multimedia Learning (Mayer, 1997) in particular which is a contemporary theory that clarifies the learning process in a multimedia environment.

Theoretical Framework

The Dual-Coding Theory.

Dual Coding Theory is a cognitive theory explaining the processing of the verbal and visual information. It was proposed by a psychologist, Paivio (1986). The theory postulates that there are two separate channels through which information is processed and stored in the memory. These two channels are verbal and non-verbal channels. Formerly, it was assumed that processing information with both verbal and nonverbal coding systems confused learners' mind because they had to deal with two types of information at one time. However, Paivio's theory has suggested that the two coding systems work independently, that is why they do not interfere with each other. In addition, although they are separate channels that code information, they are interrelated and aid each other in the process of receiving, encoding, storing and recalling information.

The verbal system processes linguistic pieces, units, or even inner speech. It processes linguistic information (i.e. text, sound) in sequential units called as "logogens" in Paivio's term. Non-verbal system, on the other hand, processes visual information (i.e. pictures, videos, animations, real objects) and stores them in spatial and synchronous units. The non-verbal units are called "imagens" in his terms. These logogens and imagens are connected with referential links. Three main themes of processing which are representational, referential and associative are realized between and within the verbal and non-verbal coding systems (Paivio, 1991). Figure 1 illustrates the relationship between verbal and non-verbal systems through the three processings in Dual Coding Theory.

Representational processing is about recognizing and receiving a verbal or non-verbal stimulus and then activating the related system. Words activate verbal representation while pictures activate non-verbal representation. As for *referential processing*, it is about activating verbal system by non-verbal system, and non-verbal system by verbal system. In other words, pictures, images or real objects activate words whereas words activate pictures and objects. *Associative processing* activates the connections between linguistic units in the verbal system and visual units in non-verbal systems. Additional information in verbal and nonverbal systems is activated through associative processing. These processing levels explain that the two distinct coding systems interact during processing information. They are independent since one can be active in processing information while the other is not. Also, they are interrelated since one can active the other system through referential connections. This theory has important implications for second or foreign language learning as the theory explains how visual and textual information are processed and how learning takes place (Ben Salem, 2006).

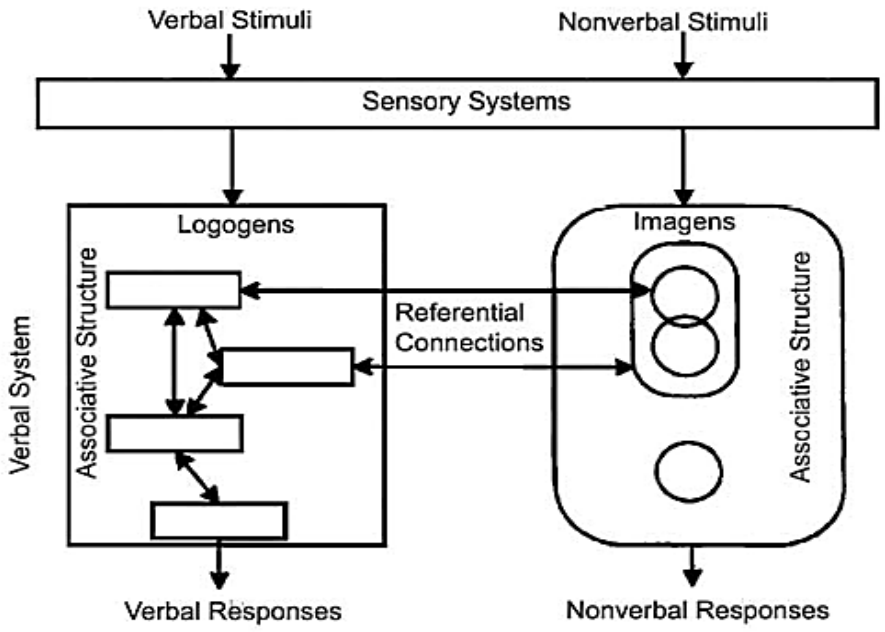

Figure 1. Dual Coding Theory (Paivio, 1986, p. 67).

Research has indicated that the activation of both verbal and non-verbal systems simultaneously have positive effects on recalling (Al-Seghayer, 2001; Paivio, 1991). Vocabulary studies also demonstrated that presenting new words with images or real objects along with their definitions resulted in better results and found to be more effective (Clark & Paivio, 1991). This theory presents a very essential foundation for this dissertation study since this study investigates foreign language learners' vocabulary learning through exposure to different combinations of non-verbal representations (pictorial glossing) and verbal representations (textual, auditory glossing) in a multimedia environment. It was posited that

the use of visuals and sounds at the same time would activate both verbal and non-verbal coding systems, which in turn, would result in better vocabulary learning and recalling than using only L2 definition alone and thus activating only one mode as it was stated by Rieber (1994) "use of pictures and illustrations associated with unknown words are effective instructional devices that are superior to words alone for memory tasks and will help L2 learners remember the words sooner and retain them longer" (p. 141). In conclusion, Paivio's Dual Coding Theory constitutes a solid framework for L2 vocabulary learning studies investigating the effects of texts, sounds, pictures, videos, animations on vocabulary learning.

The Generative Theory of Multimedia Learning.

The Generative Theory of Multimedia Learning which was also named "Cognitive Theory of Multimedia Learning" was developed by Mayer to explain how learning takes place in multimedia environments (2001). This theory centers on the idea that learning is an active process and learners are 'knowledge constructors' selecting relevant visual and verbal information, organizing that information and integrating this new knowledge with previous knowledge (Mayer, 1997). Mayer's theory actually was developed over Wittrock's (1974) Generative Theory of Learning, Paivio's (1986) Dual Coding Theory, and Chandler & Sweller's (1991) Cognitive Load Theory. However, Mayer added another dimension to these theories and their assumptions, which is the active role of learners in learning process.

As it was discussed in the previous section, Dual Coding Theory suggests that visual and verbal stimuli are processed in two separate but interconnected subsystems (verbal, non-verbal) in mind. It has been proposed that because there are two channels processing information, it is better to use both of them simultaneously to improve learning. This theory describes how information is processed in mind rather than how it is perceived by learner.

Cognitive Load Theory, in contrast, gives more importance to perception asserting that the capacity of working memory is limited and therefore visual and verbal memories should not be overloaded. Using many complex pictures or too many words at the same time causes cognitive overload for working memory and as a result, the processing of some of these elements does not happen in verbal and visual memory. It has been proposed that considering the limited capacity of working memory, the combination of more than one presentation mode by extracting unnecessary input can alleviate the load of working memory.

Mayer integrated these theories and provided a framework for multimedia learning without overloading working memory. The three main assumptions of the theory have been summarized by Mayer in Table 1.

Dual channels assumption comes from Dual Coding Theory, while limited capacity assumption derives from Cognitive Load Theory. According to dual channels assumption auditory and verbal information is processed through ears in verbal channel, while visual information is processed in non-verbal/visual channel through eyes. *Limited capacity assumption* states that each channel can process a limited amount of information at the same time. As for active processing assumption, it has been influenced by Generative Theory of Learning which explains how individuals process input they receive and states that generation refers to links between learners' new information and previous knowledge. Mayer's *active processing assumption* explains the active process of receiving the information and integration of it with pre-existing knowledge. The processes included in active processing assumption are:

> (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 model, (4) organizing selected images into a pictorial model, and (5) integrating the verbal and pictorial representations with each other and with relevant prior knowledge activated from long-term memory. (Mayer, 2014, p.54)

Therefore, a connection is built between visual and verbal information in long-term memory.

Table 1. *Three assumptions of the CTML (Mayer, 2009, p. 63)*

Assumption	**Description**	**Related Citations**
Dual channels	Humans possess separate channels for processing visual and auditory information.	Paivio, 1986; Baddeley, 1992
Limited capacity	Humans are limited in the amount of information that they can process in each channel at one time.	Baddeley, 1992; Chandler & Sweller, 1991
Active processing	Humans engage in active learning by attending to relevant incoming information, organizing selected information into coherent mental representations, and integrating mental representations with other knowledge.	Mayer, 2008a; Wittrock, 1989

On the basis of these three assumptions, Mayer makes an illustration of how learners learn second of foreign language learning in a multimedia environment as it can be seen in Figure 2. The figure describes how visual or verbal information is processed by learners and integrated into long term memory. First of all, two multimedia representations, namely words and pictures from outside world are received by sensory memory via ears and eyes. Written words and pictures are stored in visual sensory memory whereas articulated words and sounds are kept in auditory sensory memory for a while. Then, learners make selection of these inputs

taken through ears and eyes, and selected information is moved to working memory. There are two sides of working memory. The first side keeps 'raw material' (i.e. image of a picture and sound of a word). The other side keeps the organized visual and verbal information through their connections between them. This part consists of 'knowledge constructed' in working memory. Finally, the last part of the figure represents the long term memory which keeps lots of information over a long period. In order to transfer information into long term memory, learners need to integrate the information in the working memory with their previous knowledge. For storing the information in the long term memory, the information should be actively used by learners in working memory if the connection is developed by the learner between new information and prior knowledge (Mayer, 2014).

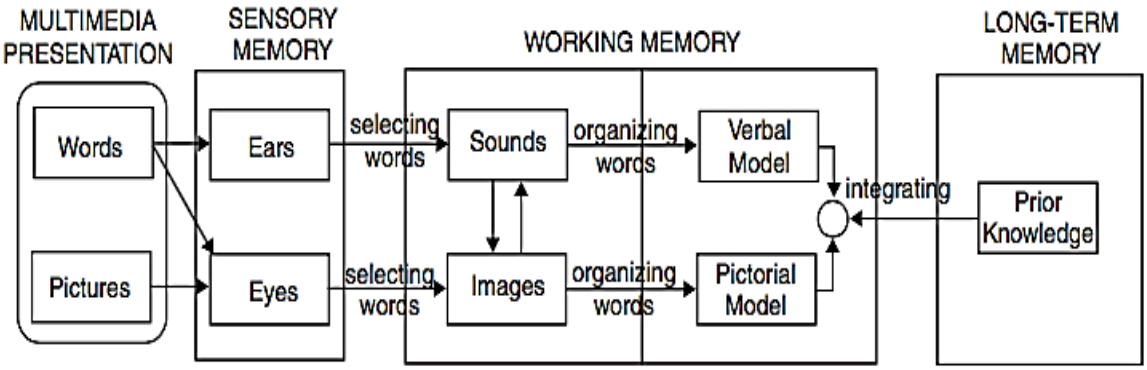

Figure 2. Mayer's Cognitive Theory of Multimedia Learning (2009, p. 61).

Consequently, Mayer's theory suggests that the use of both pictures and words simultaneously by extracting irrelevant media modes yields better learning outcomes. This, in turn, elucidates why this dissertation takes Mayer's Generative Theory of Multimedia Learning as the basic theoretical framework for investigating the influence of different modalities of multimedia representation on foreign language learners' reading comprehension and vocabulary learning for both short and long-term retention. Not only visuals and words but also sounds are used in this study in order to activate dual channels in a multimedia-based setting. Furthermore, in order to minimize the overload of working memory, this study makes simultaneous representation of pictures and texts rather than successive representation as it has been suggested by Mayer and Fiorella (2014).

L2 Reading

Reading is generally defined as "the process of receiving and interpreting information encoded in language form via the medium of print" (Urquhart & Weir, 1998, p. 22). However, the purposes of reading differ from one person to another. Some people read in order to evaluate, use information or criticize while some others read for general comprehension of a

printed material. Depending on the purpose, the nature of reading process starts to change. Therefore, a simple definition will not be enough to define the complex cognitive nature of reading (Grabe, 2009). Reading is undoubtedly "a complex cognitive skill, involving many sub-skills, processes, and knowledge sources ranging from the basic lower level visual processes involved in decoding the print to higher level skills involving syntax, semantics, and discourse and even to skills of text representation and integration of ideas with the readers' global knowledge" as it has been pointed out by Nassaji (2011, p. 173).

The complex cognitive process of reading requires various skills and sub-processes depending on the goal and type of reading. During the interaction with a text, a reader makes use of different higher level and lower level processes that contains certain procedures and components. Grabe and Stoller (2002) listed some of these processes as provided in the Table 2. The lower level processes entail decoding and are related to vocabulary and grammar knowledge whereas higher level processes are more syntactic and semantic processes that necessitate the use of background knowledge and inferencing. Readers manipulate a set of these processes while reading in L2.

Table 2. *Reading processes (Grabe & Stoller, 2002, p. 20)*

Lower-level Processes	**Higher-level Processes**
1. Lexical access 2. Syntactic parsing 3. Semantic proposition formation 4. Working memory activation	1. Text model of comprehension 2. Situation model of reader interpretation 3. Background knowledge us and inferring 4. Executive control process

There is a growing body of research in the field of second language reading recently. Most of the researchers and educators in this field have generally depended their studies on the literature of reading in L1. The contributions of the research in L1 reading to our understanding of reading process shed light into the investigation of reading process in L2. Grabe and Stoller (2002) highlighted the relation between L1 reading and L2 reading research by stating that "current research in reading is well supported by L1 reading context and is compatible with L2 reading" (p. 37). Although L1 and L2 reading have similar processes, they also have significant differences. Even the purpose of reading in L2 may be different from reading in L1. For L2 learners, reading is both a means of acquiring a language since comprehensible input is extensively provided through reading, and also an end itself as it is one of the main four skills that are necessary for learning a second or foreign language (Eskey, 2005). Reading represents a rich source of authentic language that foreign language learners need to engage in. Except pronunciation, learners interact with grammatical

constructions, vocabulary, meaningful language and spelling in another language through reading as Krashen (1993) states that learners who read occasionally:

> "acquire, involuntarily and without conscious effort, nearly all of the so-called 'language skills' many people are so concerned about. They will become adequate readers, acquire a large vocabulary, develop the ability to understand and use complex grammatical constructions, develop a good writing style, and become good (but not necessarily perfect) spellers." (p. 84).

L2 reading is more than reading in one language and includes cross-linguistic processes (Koda, 2005). Since there is another language completely different from the first language in terms of both linguistic features like syntax, morphology, phonology, orthography and grammar, and socio-cultural features, the situation gets even more complicated in the case of L2 reading process. Thus, there is a controversy among reading researchers (Fitzgerald, 1995; Grabe, 2002) about whether to use models and theories of L1 reading in L2 reading research. Nevertheless, there is still a great number of theories and models of L1 reading dominating and affecting L2 reading research.

L2 reading models.

The models and theories of L2 reading are generally based on the basic theories of language learning including behavioristic, cognitivist and constructivist approaches. While behaviorism stresses the importance of environmental factors and regards learning as something that happens as a response to a stimulus from outside, cognitivism focuses on mental information processing. In contrast, constructivism emphasizes interaction and experiences supporting the idea of forming one's knowledge on his own through experiences in social contexts. With the influence of these theoretical approaches various theories, techniques and methods have been constructed by researchers to be able to understand the process of reading in L2. Each of these reading theories explains how readers process information from different points of views. However, these theories can be generally classified into three reading processing models; namely, bottom-up, top-down and integrative processing (Bernhardt, 1991; Kintsch & Van Dijk, 1978; Silberstein, 1987). These are metaphorical models that make it possible to discuss models of reading in general.

Bottom-up reading processing.

The bottom-up approach in reading was first affected by behaviorism in 1950s considering learning as "habit formation, brought about by the repeated association of a stimulus with a response" (Omaggio, 1993, p. 45). According to today's bottom-up view, reading is accepted as a linear process where readers decode a reading text into its bits like

phonemes, letters, words, phrases, and sentences. Out of these bits of a text, readers construct meaning in a mechanical pattern by combining the smallest units to the largest linearly. In this way, learners make meaning depending on the stimulus (i.e. text and its units) rather than context or their prior knowledge. Reading process proceeds from the smallest units of a text with decoding to meaning construction piece by piece. (Grabe & Stoller, 2002). The emphasis is on text and its parts not on readers' prior knowledge and interpretation. The meaning therefore is text-driven as Samuels and Kamil (1988, p. 25) claimed that "little attempt was made to explain what went on within the recesses of the mind that allowed the human to make sense of the printed page".

One of the models based on bottom-up processing approach is Gough's model (1972). According to his model reading starts with letter scanning. After readers start to combine letters into string of phonemes, they bring phonemes together to form a meaningful word. When a word is identified with the help of lexicon, readers move to the following word and the same process is followed until a sentence is finished to comprehend the message of a sentence. Therefore, in Gough's model, decoding is the basis of reading process, and meaning would not be constructed without decoding. As Gough's model, bottom-up approaches are regarded as 'data-driven' models (Hudson, 1998; Urquart &Weir, 1998).

The textbooks prepared with a bottom-up view of reading processing in ESL and EFL focus on exercises related to sound and word recognition. The grammatical and lexical forms are of great importance while reader's experience and interaction with the text is ignored. Most of the activities are based on decoding feature of bottom-up approach. Thus, this approach is criticized for ignoring reader's previous knowledge during meaning construction process, considering reading process as just decoding letters and phonemes, and relying on basically words and structure. The recent models of reading do not present reading act as a pure bottom-up process due to its extreme view of reading (Grabe, 2009).

Top-down reading processing.

Following the changes in cognitive sciences in 1960s, behaviorism has been shattered by a new cognitive theory which highlighted the importance of the innate capacity of mind for learning. This new theory of cognitivism has influenced the research about how the first language is acquired and thus, had a great impact on second or foreign language learning in terms of explaining "how such internal representations of the foreign language develop within the learner's mind" (Omaggio, 1993, p. 57). This new cognitive approach led second language researchers to investigate how students learn to read from top-down view of reading processing. In contrast to the models of bottom-up processing, in this view reading is not

decoding the parts of a text to create meaning, but a process of making connection between the text and reader's background knowledge. During reading the reader is cognitively active in the process of understanding the text since the reader brings his prior knowledge, experiences and predictions into reading act for the construction of meaning (Smith, 1994).

The emphasis is on readers' knowledge and interpretations not on text and text units. For this reason, meaning is supposed to be reader-driven rather than text or data-driven. At the beginning of reading a text, readers bring their hypotheses or predictions to the text and then use the information in the text to confirm or disconfirm these predictions and hypotheses (Urquart & Weir, 1998). Therefore, the process of reading is not linear as it is in bottom-up models; on the contrary, it is cyclical since there is a constant process of checking the predictions so as to understand the message of the text based on context and background knowledge (Goodman, 1967). In this regard, decoding and recognizing all the bits and units in the text is not necessary in top-down models, but rather some part of the text is enough to make guesses. Top-down theories as noted earlier represent opposite views against bottom-up models since they assert that comprehension starts with higher level of processing i.e. readers' experience and predictions instead of lower levels i.e. decoding phonemes. The contrast between these two processing models was illustrated in Celce-Murcia and Olhstain's (2001) visualization of how bottom-up and top-down processes work graphically in Figure 3.

One of the typical theories of top-down approach is Goodman's (1967) "psycholinguistic guessing game". According to this game reading is continuous guessing of meaning, and readers do not read every word to comprehend the message of the text. The reading process is composed of five phases in this game. First, readers identify the form of text and make predictions about what to read. Second, readers read enough of the text to confirm their first prediction. Third, readers correct the predictions in mind if they are wrong or the information in the text is sufficient. Fourth, when the readers get the message of the text, they accommodate the prior knowledge. Lastly, as for the remaining of the text, the readers create new expectation in their mind. This reading game proceeds in a cyclical process. The lack of vocabulary and decoding are compensated by readers' prior knowledge, guesses and context which are of key importance in top-down processing models.

Like bottom-up processing model, top-down processing model is also criticized by some researchers (Eskey, 1998; Urquhart & Weir, 1998). According to the critics, one of the limitations of this model is the fact that this model emphasizes higher level skills like guessing meaning out of contextual cues and prior knowledge, and the model ignores the role and importance of decoding and grammatical forms. Another limitation is that since higher

level skills are required at the beginning of reading, this model is suitable for more proficient ESL or EFL learners. The difficulty of a text seems to be a predictor of which processing a reader can use. If the text is too difficult for a less proficient ESL reader, making predictions based on his prior knowledge of language structures will be difficult and the reader will start to decode words and sentences to extract meaning (Pulido, 2003). Top-down model is thus criticized for not providing an adequate explanation for the situation of learners with lower levels of second or foreign language proficiency.

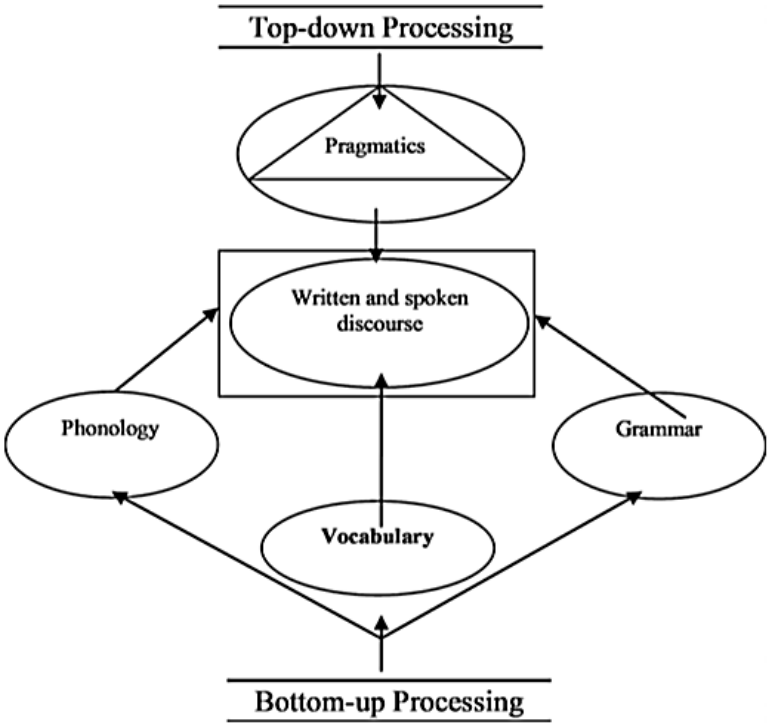

Figure 3. Vocabulary and language knowledge (Celce-Murcia & Olshtain, 2001, p. 75).

Integrative reading processing.

This model considers reading as a process in which both bottom-up and top-down processing interact together for the aim of comprehension. The two different models are blended into one model to provide a more accurate way of understanding reading process. Thus, the criticisms of each model are reduced with this approach. The term 'interactive/ integrative' has been interpreted by Hedge (2000) in two ways. First interpretation is about the relationship between reader and text as Hedge has pointed out that "reading can be seen as a kind of dialogue between the reader and the text, or even between the reader and the author" (p. 188). The second interpretation comes from this model's emphasis on the interaction of both high-level processing and low-level processing (Carrell, 1998). The reader uses different kinds of knowledge simultaneously or alternatively to understand the message of the reading text. Hedge (2000) identified the kinds of knowledge as knowledge of morphology, knowledge of syntax, genre knowledge, topic knowledge, general world knowledge, socio-

cultural knowledge. The knowledge of morphology and syntax is about linguistics which is required in order to decode the language in the text. They are called 'systemic knowledge' whereas the other kinds of knowledge are about reader's background knowledge that assists reader for getting the message of text and they are called 'schematic knowledge'. Both bottom-up reading and top-down reading are processed at the same time for building meaning. In this sense, the reading process is seen as bidirectional, not unidirectional by interactive model of reading processing (Rumelhart, 1977).

Current L2 reading theories favor interactive models and support the combination and operation of both bottom-up and top down skills to interpret texts. One of the best-known proponents of interactive models in L2 reading is Bernhardt (2005). She has constructed her compensatory model of second language reading on the basis of two significant hypotheses in SLA, namely, Cummins' (1979) Linguistic Interdependence Hypothesis and Linguistic Threshold Hypothesis. These two hypotheses emphasize the relationship between L1 reading ability and L2 reading development. According to the Linguistic Interdependence Hypothesis, reading ability in L1 and L2 has basic similarities and they are interdependent (Benhardt & Kamil, 1995). When somebody develops reading abilities in L1, he can make transfer of these abilities to another language, and this knowledge forms a basis for the development of abilities in L2 reading. The Linguistic Threshold Hypothesis; on the other hand, asserts that one needs to have a certain level of linguistic ability in L2 in order to use his L1 reading abilities in L2 reading contexts. This hypothesis argues that there is a linguistic threshold of L2 language proficiency for the development of L2 reading. Without reaching that linguistic threshold, a person cannot make much use of his L1 reading ability in L2 reading situation no matter how successful he is in L1 reading.

Bernhardt (2005) has proposed a compensatory model where she incorporates the arguments of aforementioned hypotheses. Her model is composed of three components which are 'L1 literacy, L2 language knowledge and unexplained variance (i.e. motivation, interest, content and domain knowledge, comprehension strategies). She has argued that 50% of L2 reading comprehension can be predicted based on the first two components of the model- L1 literacy 20% and L2 language knowledge 30%. The other 50% of reading comprehension depends on unexplained variance. To achieve L2 reading comprehension three components operate interactively and simultaneously. In her words the compensatory model "tries to model how knowledge sources assist or take over for other knowledge sources that are inadequate or nonexistent—i.e. what they use to compensate for deficiencies" (p. 140). With the development of L2 proficiency the interaction between top down and bottom up

processing increases, and thus the deficiency in one reading processing can be compensated with the other reading processing. Interactive approaches seem to provide a more comprehensive account of L2 reading process because they integrate both language related and reader related components within the same model.

Elements affecting L2 reading comprehension process.

Even though how reading is processed in learners' minds can be illustrated by three general approaches as mentioned above, there are still some other elements to consider in understanding of reading act in an L2. Nunan (1991, p. 70) has pointed out that "Reading is a dynamic process in which the text elements interact with other factors outside the text, in this case most particularly with the reader's knowledge of content of the text". Readers bring different factors together for the purpose of getting meaning of the text. The elements that affect L2 reading comprehension are either reader-related or text-related. Some of these elements will be briefly mentioned in this section.

First of all, the most correlated factor with second language reading is language knowledge/proficiency. Clarke's Linguistic Threshold Hypothesis is an evidence for this relationship. Many of the studies that investigate the relationship between L2 proficiency and L2 reading development consolidate this hypothesis suggesting that language learners need to have a certain level of knowledge in target language in order to transfer their L1 reading abilities and skills into target language reading process. This certain level of language proficiency is referred as a "language ceiling" by Clarke, or a "threshold level of linguistic competence" by Cummins (1979). If learners do not cross that threshold linguistically, they cannot decode the language in a text and extract meaning out of it no matter how proficient they are in their L1 reading. L1 reading proficiency remains useless in L2 reading situation without mastering enough knowledge of L2. As asserted by this hypothesis, language proficiency is an important element that should be taken into account in L2 reading process.

Another element which affects the reading comprehension in L2 is the knowledge of vocabulary. The relationship between L2 reading comprehension and vocabulary knowledge is 'bi-directional' (Nation, 2001), which means that their relationship is reciprocal and depends on each other. One can learn vocabulary best through extensive reading, and similarly one can understand a reading text best with extensive vocabulary knowledge. Since words are the building blocks of a reading text, reading comprehension is achieved by knowing the meanings of most of these words. Vocabulary knowledge is a must for constructing meaning from a reading material (Nagy, 1988). Since a certain degree of vocabulary knowledge is required for comprehension, researchers have started to investigate

how much lexical coverage is needed to understand a text (Schmitt, 2010). In a very early study, Laufer (1989) claimed that knowing 95% of the words in a written material is fundamental for reading comprehension. On the other hand, the findings of a later study, by Hu and Nation (2000) indicated that 98% of words need to be covered. The same result was also reported by Schmitt *et al*. (2011). As for the relationship between reading comprehension and vocabulary knowledge, Anderson and Freebody (1981) proposed a very strong correlation between them by pointing out that "a reader's general vocabulary knowledge is the single best predictor of how well that reader can understand text" (p. 3). Based on the findings of these studies, one can conclude that the more vocabulary in a reading text is known, the greater comprehension of the text can be achieved.

During reading process, recognizing words is a much more problematic situation for second language learners compared to recognizing words in the first language. This process is not as fast and automatic as it is in target language (Favreau & Segalowitz, 1983). Research indicates that in general second or foreign language learners do not identify words correctly whether they use guessing strategies or not (Bernhardt, 1991). In case of not recognizing words, second language learners tend to guess their meanings instead of looking up a dictionary. The strategy of guessing does not necessarily end with a correct meaning as well. There are some important factors in the situation of incorrect guessing. These variables are proficiency level, vocabulary knowledge, the frequency of unknown word in a text and the use of guessing strategies, the number of unknown words all over a text (Nation, 2001). Especially readers' proficiency level is the most important factor in the successful guessing situation (Bengeleil & Paribahkt, 2004). When readers have enough proficiency in L2, they can interpret the unknown words in a reading text more successfully than less proficient readers as they can compensate their lack of vocabulary knowledge with their knowledge of target language.

Another significant component of L2 reading process is schematic knowledge. A schema is a kind of framework that is shaped through one's experience with the world. It can be considered as 'the organized background knowledge' (Brown & Yule, 1983, p. 248). Schematic knowledge "… incorporates all the knowledge of a given type of object or event that have been acquired from past experience and operate in a top-down direction to help us interpret the bottom-up flow of information from the world" (Bell, 1993, p. 249-250). There are different categorizations of schematic knowledge such as content schema, cultural schema and formal schema.

Content schema is the background knowledge of content in a reading material (Carrell *et al*., 1988). Having previous knowledge about the topic of a text facilitates understanding of the text. A positive relationship was found between topic familiarity and L2 reading comprehension by various studies (Barry & Lazarte, 1995; Carrell, 1984; Moravcsik & Kinstsch, 1993; Schmitt *et al*., 2011). It has been hypothesized that possessing background knowledge about the content/topic of a text will simplify reading process for second language learners since topic familiarity will reduce the load of working memory and learners will be able to pay more attention to form and meaning (Lee, 2007) during reading process.

In relation with content schema, cultural schema is more related to the mental representations formed by one's interaction with his culture and includes culture-specific information. L2 learners encounter with many texts including topics and expressions unfamiliar to readers from different cultures because writers generally write their works to their audience who share the same culture with common values and norms. In this regard, for second language learners the lack of cultural schemas necessary for comprehension of a given text may result in misunderstanding or difficulty in understanding of the text especially for authentic texts (Gasigijtamrong, 2003; Johnson, 1981; Rumelhart, 1977). L2 learners not only need to master language structure, grammar and lexis, but they also should be acculturated into the culture of the target language in order to be literate in an L2.

Formal schema, on the other hand, refers to the previous knowledge of a text's rhetorical structure. It involves "knowledge of different text types and genres and also includes the knowledge that different types of texts use text organization, language structures, vocabulary, grammar and level of register differently" (Alidib, 2004, p. 19). Identifying rhetorical structures and settings of a text which requires knowledge of formal schema can help second language readers to understand the text easily (Carrell, 1984). As knowledge of grammar and vocabulary, knowledge of text structure is also required for successful reading comprehension. Research has demonstrated that readers who have the knowledge of how a definite type of text is organized and structured find reading of such texts easier (Carrell, 1992). Moreover, the studies examining the relationship between reading comprehension and awareness of text organization have mentioned positive relationship between these elements (Carrell, 1992; Hague, 1989).

In the context of reading, Cook (1989) defines schematic knowledge as "…. mental representations of typical situations … used in discourse processing to predict the contents of the particular situations which the discourse describes" (p.69). In reading process readers do not start reading with an empty brain. They bring their background knowledge, schemas

(content, cultural, formal) into reading process and try to decode a written text with their knowledge of language and relate that meaning or information to their relevant body of schematic knowledge. The research has also indicated that more familiar texts are comprehended and recalled better than unfamiliar passages by participants (Carrell, 1981; Johnson, 1981; Markham & Latham, 1987). For this reason, in order to be able to make sense of a reading text, readers should use some prior knowledge of content, text structure and culture. Without making sense of what a reading material is about depending on their schematic knowledge, readers cannot understand the message in that material no matter how that reading material is decoded perfectly as also noted by Grabe (2009, p. 14) "comprehension occurs when the reader extracts and integrates various information from the text and combines it with what is already known". Hence, it can be said that information about text structure as well as content and culture contribute to L2 reading comprehension. The more familiar a given text is for a L2 reader with respect to content, rhetorical structure and culture, the more comprehensible the text becomes.

Apart from language proficiency, vocabulary knowledge and schematic knowledge involving knowledge of content, culture and textual structure, reading strategy is another key factor which is closely related to reading comprehension. The term 'reading strategy' has been defined differently by researchers depending on the contexts of L1, L2 and FL reading (Griffiths & Oxford, 2014). Nevertheless, there is a consensus in the L2/FL learning field that reading strategies are facilitating tools for comprehension (McNamara, 2007). To define the term, one of the most cited definition is Barnett's (1989, p. 66). According to this definition, reading strategies are "mental operations involved when readers purposefully approach a text to make sense of what they read". Anastasiou and Griva (2009, p. 283-284) have also defined reading strategies as "specific, deliberate, goal-directed mental processes or behaviors, which control and modify a reader's efforts to decode a text, understand words and construct the meaning of a text".

It can be inferred from these definitions that reading comprehension can be promoted by using these conscious or unconscious mental techniques to deal with comprehension issues. There is a great deal of evidence that supports the positive effects of various reading strategies on reading comprehension (Anderson, 1991; Baier, 2005; Barnett, 1989; Clifford, 2008; Malcolm, 2009; Nordin *et al.*, 2013; Yukselir, 2014; Zhang, 2009). For instance, Cogmen and Saracaloglu (2009) reported that utilizing reading strategies enhanced reading comprehension and assisted learners to solve comprehension difficulties at both sentence and word level. Likewise, Manoli et al (2016) examined the effects of strategy training on reading

performance of EFL learners and found that the instruction of reading strategies improved reading performance. Moreover, Barnett's study (1988) also indicated that learners instructed about how to manipulate strategies in a reading task were more successful in reading comprehension than learners instructed traditionally. Since 1970s when the concept 'strategy' was first introduced, several general findings have been obtained from reading strategy research. Grabe (2009) has formed a summarized list of these findings as shown in Table 3. It is clear from aforementioned study results and Grabe's list that reading strategies play a significant role in reading comprehension.

Table 3. *Findings from the reading strategy use (Grabe, 2009, p. 227)*

	Reading Strategy
1.	All readers use many strategies.
2.	All readers engage in more basic and more local strategies when reading frustration-level texts.
3.	Good readers and poor readers use the same types of strategies.
4.	Good readers use strategies more effectively than do poor readers.
5.	Good readers are more metacognitively aware of the strategic responses to text difficulties.
6.	Good readers use repertoires of strategies in combination rather than overusing single strategies.
7.	Good readers automatize certain combinations of strategies as routine effective responses to reading-comprehension needs.
8.	Good readers are actively engaged in reading comprehension.
9.	Reading strategies can be taught effectively.
10.	Strategy instruction can improve reading comprehension.
11.	Strategy instruction should be a central component of reading-comprehension instruction.

In conclusion, there are some crucial factors affecting reading comprehension process such as language proficiency, vocabulary knowledge, schematic knowledge about content, text structure and culture, and reading strategy use. These elements as well as their relationships with L2 reading comprehension process have been presented throughout this section. These elements and their roles in reading process should be carefully reviewed in any study investigating L2 reading comprehension process.

Text genre and L2 reading.

Reading is a complex cognitive process that requires lots of skills and abilities by integrating both bottom-up and top-down processes depending on the goal and type of reading. By using these skills and processes "comprehension occurs when the reader extracts and integrates various information from the text and combines it with what is already known." (Koda, 2005 cited in Grabe, 2009, p. 14). Since reading comprehension happens by extracting knowledge from text, there are different types and genres of texts written in various structures

with different purposes. It is crucial to understand the nature of text genre and type to construct meaning out of text. Therefore, in addition to the elements mentioned above, text genre is one of the significant issues to be considered for the purpose of understanding the reading process.

As text genre is one of the crucial factors affecting reading comprehension, it seems necessary to explain the concept 'genre'. Genre is a French term that means "class" or "kind". In literature, genre is used to refer to different literary texts like novel, poetry, drama etc. However, in linguistics it refers to a certain "type of text" (Allen, 1989). Hatim and Mason (1990, p.140) defined text type as "a conceptual framework which enables us to classify texts in terms of communicative intentions serving an overall rhetorical purpose". There are some researchers making a distinction between genre and type (Biber, 1988; Hammond *et al*., 1992; Schauber & Spolsy, 1986). According to Biber, genre makes classification of texts based on external format and situation of use whereas type is used for grouping texts based on similar linguistic forms. For Hammond *et al*. student essays, recipes, formal letters, police reports, biology textbooks are examples of different genres while types of texts are exposition, description, procedure and problem-solution and review. More than one text genre may belong to the same text type and vice versa. For instance, student essays and formal letters are distinctive genres but may share the same text type which is exposition. Nevertheless, these two terms-genre and type- are used interchangeably in L2 reading research.

There are many different classifications of text types among linguists and second language researchers. To illustrate, Hedge (1988) presented text types as narratives, cause and effect, discussion, compare and contrast, classification, review. Yet, Meyer (1975) mentioned four categories of text types which were time order, comparison, cause-effect and description depending on text structure. On the other hand, according to Werlich's typology (1976), there were five basic text types: "description, narration, exposition, argumentation and instruction". Among these different confusing and overlapping categorizations of text types, two distinct text types which are narrative and expository or informational have attracted researchers' interest and have been mostly studied as they are clearly differentiated from each other in terms of their characteristics (Alderson, 2000).

Narrative texts are written in order to tell a story and entertain. They are generally the products of writer's imagination. There is a plot in narrative texts as well as characters, settings, beginning, middle, ending and conflict. Events occur in sequence. On the other hand, expository texts are written to give information and describe. They consist of introduction, body and conclusion parts, and include figurative language, analysis and even argumentation

(Alderson, 2000). Expository texts are products of investigations done by the writers unlike narrative texts. While readers need to focus on events, characters and ordering in narrative texts, readers need to use logical analysis, focus on facts and evidence to understand an expository text. In general, it is thought that expository texts are more difficult to understand than narrative texts. McCormik (2007) has suggested some factors that may explain why expository texts are hard to read. He has argued that in expository texts there are new information to be learned, vocabulary is more specific to the topic, text structure can be in various forms, text's readability level is higher and it is hard to keep new information in the mind. However, narrative texts are considered to be more predictable compared to expository texts because of their typical structural features (Landers, 2010). Marzban and Seifi's (2013) study found a similar result. They explored the effect of genre instruction on comprehension of narrative and expository texts. At the end of the study, they discovered that the instruction of narrative structure had an effect on reading comprehension of learners whereas the instruction of expository structure had no significant effects on reading comprehension.

Grabe has claimed (1988) that distinguishing text genres and various text types has an essential role in reading comprehension process. In addition, John (2008) has noted that in order to understand and interpret a text, learners need to develop genre awareness about particular texts and their features. There are also many empirical studies confirming genre effects on reading comprehension process. To illustrate, in a classroom study Hyons (2002) investigated the influence of genre instruction on reading comprehension of English as a second language. The result of the study suggested that learners getting genre instruction had focused more on rhetorical features of texts, had higher speed of reading, had more awareness about the place of main ideas and had more fun while reading. Likewise, in a much later study, Rozimela (2014) attempted to investigate the relationship between reading comprehension and genre knowledge. Assessing the knowledge of genre with a test including questions related to the characteristics of five different genres, the researcher applied reading comprehension test after the participants read ten texts from five different genres. The findings of the study indicated that there was a significant relationship between text comprehension and genre knowledge. Another significant effect of genre knowledge on reading performance was also found by Alidib (2004) who investigated the influence of knowledge about two different text genres; play and novel on college students learning French as a second language.

Since the knowledge of text genre and genre instruction has a crucial role in understanding a text, this influence of text genre should be taken into account in L2 reading

comprehension studies. Therefore, this study also takes consideration of text genre which is a neglected dimension in gloss research (Far, 2016) and uses three different texts namely a short story, a textbook article and a biography from the most common types of texts used in language learning environments which are narrative and expository in the light of the aforementioned information.

Following the discussion of L2 reading process and its components with a particular focus on text genre, the next section explains L2 vocabulary learning process since one of the purposes of this dissertation is to explore the effectiveness of multimedia glossing on vocabulary learning. The following section explains the importance of vocabulary knowledge in second or foreign language learning and the distinction between explicit versus implicit vocabulary learning.

L2 Vocabulary Learning

Vocabulary learning has a fundamental role in language learning. It can be regarded as the most significant aspect of second language learning (Knight, 1994, Schmitt, 2008). Candlin (1988, p vii) stated that "… the study of vocabulary is at the heart of language teaching in terms of organization of syllabus, the evaluation of learner performance, and the provisions of learning resources …". Vocabulary knowledge is a necessary knowledge in mastering another language (Schmitt, 2008). To master another language requires proficiency in four basic language skills: listening, reading, writing, and speaking. Knowledge of vocabulary is imperative for the development of these skills (Gass, 1999). McCarthy (1990, p. 1) has expressed the significance of vocabulary learning as follows: "it is the experience of most language teachers that the single biggest component of any language course is vocabulary." In a similar vein, Wilkins (1972) has highlighted the importance of vocabulary stating that "… while without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (p. 111–112).

What does it mean to know a word? This question gets different answers from several researchers in the field. George (1983) suggests that knowing a word entails the knowledge of the form, meaning, function and position of this word. According to Nation (1993) knowing a word requires knowledge in two dimensions which are receptive knowledge and productive knowledge. While receptive knowledge is about recognizing a word, productive knowledge means using that word accurately. Nation and Meara (2010, p. 47) define word knowledge as "the ability to recognize the spoken and written forms as well as the meaning of a word". On the other hand, Oxford and Crookall (1990) states that word knowledge entails the appropriate and effective use of that word in all four main language skills: speaking, reading, listening and

writing. Henriksen (1999) mentions two concepts for word knowledge namely, 'breadth' and 'depth'. Breadth of word knowledge describes the size of lexicon a learner has in mind; however, depth of word knowledge is about how well that word is known including its relations with other words like antonyms, synonyms, hyponyms and collocations. These two concepts form a continuum that shows the level of word knowledge.

As it is seen, the different knowledge of a word such as meaning, form, function, production, synonym, antonym, collocation etc. are difficult to be learned simultaneously. Some of this knowledge needs to be learned before the others. In order to learn synonyms of a word, one needs to learn its meaning at first. Thus, it is difficult to take all types of word knowledge into consideration at the same time (Schmitt, 2000). For this reason, there are not many studies investigating all components of word knowledge simultaneously. In this study, form and meaning of words – basic types of word knowledge (Schmitt, 2000) are required for vocabulary knowledge. In other words, vocabulary knowledge is assessed by recognizing word form and recognizing the meaning of that word as in other studies (Al-Seghayer, 2001; Al Ghafli, 2011; Chun & Plass, 1996a).

Acquiring a rich vocabulary repertoire for language learners is a must and a continuing challenge as well (Belisle, 1997). Since vocabulary learning is a complex process affected by a number of variables and elements, it is not fully understood how to learn a word and which method is the most useful one for promoting lexical learning (Nation, 2001; Schmitt, 2008). That is why, there has been a growing amount of literature on the enhancement of vocabulary learning in second and foreign language learning and teaching field (Meara, 1996).

The literature on vocabulary learning has revealed that vocabulary learning has gone through different stages affected by developing methods in language learning. In the years when Grammar-Translation Method was influential in language learning and teaching, learners were exposed to word lists with their translations in native language for development of vocabulary learning. With the appearance of Direct Method in 1950s, the direction shifted from rote memorization of word lists towards teaching vocabulary in context. In 1970s with the development of more communicative approaches, vocabulary started to be taught for communication purposes in certain situations. Along with more innovative methods, it was realized that vocabulary learning required more than looking up a dictionary for communicative situations only. Vocabulary learning was more complex than it was thought. In recent years, vocabulary learning has been thought to be developed by learners' construction of meaning via interactive processes and exposure to authentic L2 materials (Baturay, 2007). Instead of presenting only word lists, translations, synonyms or definitions,

vocabulary learning process should provide information through more channels, multiple senses by also creating motivating and appealing environment which is possible with CALL and multimedia learning. Hence, today the number of studies using CALL programs with the integration of multimedia features has increased for vocabulary learning and teaching purposes.

Second language learning researchers have focused on how to enhance vocabulary learning with an increasing interest. Two approaches have been proposed to promote vocabulary learning in literature, namely explicit instruction/intentional learning and implicit/incidental learning (Hunt & Beglar, 1998). This distinction has been adopted in many studies, and vocabulary learning process has been categorized in the two types in general (Nation, 2001). It is necessary to explain these two approaches to understand vocabulary learning studies. Thus, the section further provides a discussion of incidental and intentional vocabulary learning.

Intentional and incidental vocabulary learning.

Intentional and incidental vocabulary learning are main approaches used for describing the activities in learning and teaching of vocabulary. In intentional vocabulary learning, there is an explicit emphasis on vocabulary items (Schmitt, 2008). It is defined by Hulstijn (2001) as "any activity geared at committing lexical information to memory" (p. 217). First, target lexical items are identified, and then they are taught to learners explicitly by considering both their meanings and forms. In incidental vocabulary learning; however, lexical items are not concentrated on in the learning process, they are rather learned implicitly (Hunt & Beglar, 1998). Incidental vocabulary learning is defined by Wesche and Paribakht (1999) as "new knowledge or competencies that learners acquire as a 'by-product' that is when they do not specifically intend to learn them" (p. 176). In other words, incidental vocabulary learning takes place while learners are engaged in another activity like reading and the attention of learners is on message (Huckin & Coady, 1999). For the distinction between incidental and intentional vocabulary learning also Ellis (1994, p. 2) remarks that "whereas intentional learning requires focal attention to be placed on linguistic form, incidental learning requires focal attention to be placed on meaning, but allows peripheral attention to be directed at form". Although it seems that incidental vocabulary learning takes place just 'by-product' without any attention to lexical items, there is indeed a "minimal degree of conscious awareness (explicit learning process), and learners are not completely passive receivers (Rieder, 2003).

Research has indicated that both intentional vocabulary learning and incidental vocabulary learning can lead to higher vocabulary learning outcomes (Hulstijn, 1992; Nation, 2001). However, there is also a comparison between these two approaches with respect to their efficiency in the development of vocabulary knowledge (Ben Salem, 2006). According to Nation (2011), intentional vocabulary learning leads to bigger vocabulary size than incidental learning. Similarly, Schmitt (2008, p. 341) argues that intentional vocabulary learning generally results in "greater and faster gains, with a better chance of retention and of reaching productive levels of mastery". On the other hand, incidental vocabulary learning has been considered as the essential part of L2 vocabulary learning, and most of the vocabulary is considered to be gained incidentally while learners are engaged in other cognitive activities by the researchers in the field (Hulstijn & Laufer, 2001; Krashen, 1989; Rieder, 2003; Wesche and Paribakht, 1999). Incidental vocabulary learning has advantages when compared to deliberate learning such that lexical items are learned in context, they can be retained in the memory for longer times through extensive reading, vocabulary learning and reading can take place simultaneously (Kweon & Kim, 2008), and incidental vocabulary learning "helps readers acquire their (words') full semantic and syntactic prosperities" as it is contextualized (Krashen, 1989, p. 450).

There are also differences between intentional and incidental vocabulary learning with respect to methodology. The instruction is delivered to participants differently. For instance, in intentional vocabulary learning studies, before giving any material participants are told that they will be tested on vocabulary retention after they finish a reading task. In this regard, participants pay extra attention to lexical items while completing the task. In contrast, the learners are not either announced about a test beforehand in incidental vocabulary learning (De Ridder, 2003; Laufer & Hulstijn, 2001; Paribakht & Wesche, 1999) or they may be pre-announced about a reading test but not a vocabulary test. Regarding this methodological distinction, the present study adopted the design of incidental vocabulary learning approach since there was no forewarning about a vocabulary test for the participants in this study.

One of the main disadvantages of incidental vocabulary learning is that inferring the meaning of a word from context may not result in accurate learning all the time. Contextual information may be ambiguous, inadequate and unreliable for L2 learners to derive exact meaning of words that may affect vocabulary learning negatively (Hulstijn, 1992). Learners should be supported with sufficient additional explanatory and understandable linguistic and semantic cues in order to manipulate context effectively. As suggested by several studies, these disadvantages may be eliminated by increasing vocabulary knowledge in incidental

vocabulary learning such as using dictionaries, glosses, repetition of words and etc. (Hulstijn *et.al*., 1996).

Among the strategies, techniques and ways of vocabulary learning in incidental vocabulary learning, glossing is one of the most useful and practical means. Glossing is an easy way of learning meanings of unknown words in a reading material since it does not interrupt reading process in contrast to dictionary usage. Moreover, learners get accurate meanings through it, which in turn prevents incorrect guessing from context (Nation, 2001). Therefore, this useful means of vocabulary learning needs further interest and attention. To that end, the next section describes glossing, its advantages, types, and presents relevant studies explaining how glossing and various combinations of glosses influence learning new words in a second or foreign language and reading comprehension.

Glossing

The term, gloss is defined as "a brief definition or synonym of unknown words provided in text in L1 or L2" by Nation (2002, p. 174-175). A similar definition is made by Pak (1986) and Lomicka (1998) describing glosses as short explanations or definitions of words given at the end or side of a text to make reading comprehensible. In his article, 'What is in a gloss' Roby (1999) defined glosses as "many kinds of attempts to supply what is perceived to be deficient in a reader's procedural or declarative knowledge" (p. 96). His definition is more comprehensive since glosses are much more than definitions or synonyms or translations. He classified glosses in detail depending on their authorship, presentation, focus, language, function and form as provided in Table 4. Regarding gloss function, for instance, in addition to providing linguistic and definitive explanation, glosses may also encourage readers to be aware of their actions during reading meta-cognitively. As a contribution to this taxonomy, Chun (2001) categorized glosses according to their locations. Glosses can be given internally within the reading text or externally outside of the text. She asserts that it is easier to follow the reading when the glosses are internal. Segler (2001); on the other hand, defined glosses as short explanations or translation of technical and difficult texts and classified them into textual glosses, aural glosses and pictorial (visual) glosses.

Glosses even differ in terms of the knowledge they include. Their focus may be textual such as definition or extra-textual like extra topical information. They may be provided in first language or target language. In the light of the technological developments and CALL multimedia features have been combined with glosses so that glosses can be supported by verbal, visual and aural information in a computer environment. Therefore, glosses can be easily integrated with various forms of media in hypertexts through nonlinear links and nodes.

Table 4. *Roby's Taxonomy of Glosses (1999, p. 96)*

- I. Gloss Authorship
  - A. Learners
  - B. Professionals
    - 1.Instructors
    - 2.Material Developers
- II. Gloss presentation
  - A. Priming
  - B. Prompting
- III. Gloss functions
  - A. Procedural
    - 1.Metacognitive
    - 2.Highlighting
    - 3.Clarifying
  - B. Declarative
    - 1.Encylopedic
    - 2.Linguistic
      - a. Lexical
        - i. Signification
        - ii. Value
      - b. Syntactical
- IV. Gloss Focus
  - A. Textual
  - B. Extra Textual
- V. Gloss Language
  - A. L1
  - B. L2
  - C. L3
- VI. Gloss Form
  - A. Verbal
  - B. Visual
    - 1.Image
    - 2.Icon
    - 3.Video
      - a. with sound
      - b. without sound
  - C. Audio (only)

Glosses whether they are L1 or L2, mediated or not are in general considered as useful tools helping learners in many ways. There are many studies confirming the usefulness of glosses for reading comprehension (Aust *et al*., 1993; Davis, 1989; Jacobs, 1994; Ko, 2005) and for vocabulary learning (Chen, 2002; Chun & Plass, 1996a; Gettys *et al*., 2001; Jacobs *et al*., 1994; Kost *et al*., 1999; Miyasako, 2002). In his book, Nation (2001) pointed out several positive effects of glosses. First of all, glosses make it possible to present difficult and original texts for the learners without any adaptation or simplification. Second, sometimes learners try to guess the meanings of unknown words from the context which may not be true all the time. However, with glossing the meanings of the words are given exactly and accurately, which affects the understanding of a reading material directly. Third, glosses do not interrupt reading process as much as dictionaries especially when they are given near the words they define. Learning vocabulary takes less time with glossing as it has been stated by Gettys *et al*. (2001, p. 91) that glosses "save students' time and effort in reading L2 texts".

In conclusion, during reading learners' attention to new vocabulary can be raised by glosses and thus, learning process may be facilitated. Nagata (1999) also emphasized the advantages of marginal glosses on vocabulary learning as Nation. He regards glosses as easy to use. Readers' attention is directed to target words. Retention of vocabulary is better since readers are engaged in processing words by referring the glosses. And lastly, he argues that

meaning is directly connected with words which make meaning-form connection stronger. Apart from these advantages, another benefit of glosses is that they promote autonomy since readers can make their choice whether to look up the glossed word or not (Shahrokni, 2009). Thus learners become responsible of their own learning.

There are a number of studies investigating the impact of glossing on either vocabulary learning or reading comprehension from different perspectives and in different ways. Some of these studies explored and compared the effectiveness of L1 and L2 glosses on vocabulary acquisition or comprehension of text (Chen, 2002; Ertürk, 2016; Yoshii, 2006). Some others investigated the impact of multiple-choice glosses on either vocabulary learning or reading comprehension (Farvardin & Biria, 2012; Miyasako, 2002; Nagata, 1999). Also, there are studies integrating multimedia features such as text, sound, picture, video or animation into glosses and examining the effects of various combinations of these multimedia features on either vocabulary learning, (Al-Seghayer, 2001; Plass *et al*., 1998; Yeh & Wang, 2003; Yoshii & Flaitz, 2002; Yoshii, 2006; Zarei & Hasani, 2011), reading comprehension (Alessi & Dwyer, 2008; Lomicka, 1998; Sakar & Erçetin, 2005) or both (Akbulut, 2007; Al Gahfli, 2011; Ben Salem, 2006; Tabatabaei & Shams, 2011; Yanguas, 2009; Zarei & Mahmoodzadeh, 2014).

L1 and L2 glossing.

Some researchers have examined and compared the effects of glossing presented either in the native language of research participants or in the target language that participants learn as second or foreign language on L2 vocabulary learning or reading comprehension. Chen (2002); for instance, conducted a study on eighty-five college freshmen Tai learners of English. Participants were randomly assigned to one of the three groups receiving either an L1 gloss (Chinese), an L2 gloss (English) or no gloss. They were expected to read an English text with 20 glossed words. As a result, L1 and L2 gloss group outperformed no gloss group, but no significant difference was found between L1 and L2 gloss groups. In another earlier study where no significant difference was reported between L1 and L2 gloss Jacobs, Dufon and Fong (1994) also compared the effects of L1 glosses with L2 gloss. Eighty-five students learning Spanish as a second language took part in the study. They were asked to read a Spanish reading material under three gloss conditions: no-gloss, L2 (Spanish) gloss and L1 (English) gloss. Two vocabulary tests were used to obtain data. The first vocabulary test was applied after the participants read the text, and the other test was given four weeks later to measure retention. In the light of the research findings, no meaningful difference was reported between L1 and L2 glosses.

On the contrary to Chen (2002) and Jacobs *et al*. (1994)'s studies that gained similar results, Lü *et al*. (2005 as cited in Hong, 2010) obtained different findings while studying L1 and L2 glosses. They formed two groups with twenty-five students for each. An English article was glossed differently for each group. Once the participants finished reading the text, an immediate vocabulary test was handed out to measure their level of vocabulary gains. The delayed vocabulary test was applied two weeks later. As the finding of the study indicated, Chinese gloss group were more successful than English gloss group in the immediate test and as for the delayed test again, lower level students in Chinese gloss group performed better than the other gloss group. Öztürk & Yorgancı (2018) conducted a study with the same aim in Turkish context. They worked with fifty pre-intermediate learners of English at tertiary level. Divided into two groups, they were demanded to read some texts glossed either with L1 Turkish or L2 English definitions of target vocabulary during semester. After reading each text, they were required to take both production and word recognition tests. The analysis of the test scores demonstrated that there was a significant difference between L1 and L2 glossing groups. In line with the previous studies, L1 glossing was found to be more effective in learning and recalling vocabulary.

As one of the research questions investigating L1 and L2 gloss difference in aiding incidental vocabulary learning, Yoshii (2006) also reached similar results. The researcher studied with one hundred ninety-five Japanese students learning English as foreign language at tertiary level. The participants were grouped into four conditions: 1) L1 text gloss, 2) L2 text gloss, 3) L1 text-picture gloss, 4) L2 text+ picture gloss. After reading text with glosses two vocabulary tests were used to collect data. In the definition-supply tests and recognition tests used in the study to evaluate vocabulary acquisition of the participants enrolled in two different universities in Japan, no significant differences were found between L1 (Japanese) and L2 (English) gloss types, and both glosses had a positive effect on vocabulary learning. However, a significant difference was found between text-picture gloss groups and text only group in definition-supply test.

In a later study, Myong Hee Ko (2005) studied the effect of glosses on reading comprehension. In an L2 reading context, she divided ninety-four participants who were college students in a Korean university into three different gloss modes; no-gloss, L1 gloss (Korean) and L2 gloss (English) mode. Twelve of the participants were asked to think aloud, while the others participated in the study. The participants were requested to read a text and answer a multiple-choice comprehension test. After the test, they were administered a questionnaire. Interestingly, the findings of the study demonstrated that only L2 gloss mode group outperformed in the test. However, in the think-aloud protocols it was observed that

both L1 and L2 gloss groups were faster in reading and understood easily compared to the no-gloss group. In the questionnaire, the participants preferred L2 glosses. But still no significant difference between gloss and no-gloss groups was found according to the statistics. Another similar study was conducted by Azari, Abdullah and Hoon (2012) in Malaysia with postgraduate students from Iran. The researchers also formed another treatment group, L1+ L2 gloss group. In this research seventy-six participants with low proficiency level read six texts under four conditions, no-gloss, L1 (Persian), L2 (English) and lastly L1+ L2. However, data were gathered via recall protocols not multiple-choice tests. The analysis of recall protocols showed that treatment groups were significantly better than no-gloss group, which is a different result from Ko's study (2005). Yet, no significant differences were found regarding reading comprehension between treatment groups.

However, Xu (2010) aimed to examine the relation between different types of glosses and L2 vocabulary acquisition. The types of glosses used in the study was L1 (Chinese), L2 (English) and the combination of Chinese and English. The study was carried out with one hundred and three college students with similar proficiency level of English at a Chinese university. A reading material involving eighteen target words was glossed in the way that six target words in L2, six in L1 and remaining six in both L1 and L2. All of the students read the text under the same conditions and completed a test measuring reading comprehension along with a vocabulary test immediately. The same vocabulary test was handed out a week later. The results indicated that although no meaningful difference was discovered among the three types of annotations, L1 glosses were found to be the most influential in the immediate test while L2 glosses were the least influential in vocabulary tests. However, L1 + L2 were the most effective in delayed vocabulary test. For the effectivity of L1 glosses over L2 ones, the researcher suggested that learners did not want to read English definitions because they were regarded as longer and harder to understand than L1 equivalents. In parallel with Xu's study, in their study Meihami and Meihami (2014) investigated the effectiveness of L1 Persian glosses and L2 English glosses on English vocabulary learning. Studying with sixty intermediate level students at a language teaching institute, the researchers divided the participants into three groups: L1 glossing, L2 glosses and no glossing group. After the participants read a text including 10 target words according to their groups taking different treatments, they answered a vocabulary test. The test results indicated that there was a significant difference between treatment and control groups. However, no meaningful difference was recorded between L1 glossing and L2 glossing. The opinions of the learners, in contrast, showed that they favored L1 glossing. Both of these studies did not find a significant difference between L1 and L2 glossing.

In a very recent study, Ertürk (2016) explored the effectiveness of L1 and L2 glosses on incidental vocabulary learning through reading with 126 college students at Nigde University. The participants with low English proficiency were asked to read a text in three conditions: L1 (Turkish) gloss, L2 (English) gloss and no gloss. However, the results of the multiple-choice vocabulary tests demonstrated that L1 gloss group had significantly better scores than L2 gloss group, and even no gloss group significantly outperformed L2 gloss group. Ertürk's study showed different results from Yoshii and Chen's study. This situation may result from the participants' low L2 proficiency level that hindered the comprehension of L2 definitions. In a similar study carried out in 2015 by Vela, the proficiency level affected the results of the study in the same way. The researcher selected the participants from two different levels of proficiency: low and high. There was also a control group. In three groups, one-hundred and twenty participants were asked to read a text according to their levels. The experimental groups were provided with L1 and L2 glosses. Both their vocabulary learning and reading comprehension were assessed in the study. The results showed that experimental groups were better than control group in the tests, however low proficiency group with L1 glosses was more successful whereas high proficiency group benefitted from both L1 and L2 glosses.

Depending on the proficiency level of the participants or assessment types, the findings of the aforementioned studies have slightly mixed results indicating either no significant difference between L1 and L2 gloss or better performance in both gloss conditions than no gloss condition, or better performance in L1 gloss compared to L2 gloss. However, the results of attitude questionnaires used in some of the studies mentioned earlier in this section generally showed that learners prefer L1 glosses over L2 glosses.

Paper-based versus hypermedia glosses.

The development of computer technology has brought about innovations and novelty into education and language teaching in particular. Traditional paper-based glosses which have been used as presenting various kinds of information like notes, definitions, interpretations, synonyms, grammar explanations, comments, directing questions and even references to history, geography and culture (Lomicka, 1998) on paper for the understanding of a reading material, have been transferred into computer setting. With digitalization of glosses, different forms of information such as pictures, videos, graphics, animations and sounds have been added to traditional glosses and thus, the term hypermedia has been used to refer this new type of glosses. With the change technology has brought, paper-based glosses

have started to be replaced by hypermedia and multimedia glosses. Accordingly, researchers have conducted studies to compare traditional glosses and hypermedia glosses.

In general, there are some benefits of hypermedia glosses in comparison to paper-based glosses. As it has been mentioned earlier, instead of one form of input which is textual information, it is possible in hypermedia glosses to present information in different modes: textual, visual or auditory (Chun & Plass, 1996a; Erçetin, 2003; Lomicka, 1998). In addition, hypermedia annotations can be accessed in a nonlinear way worldwide (Martinez-Lage, 1997) unlike traditional glosses. Also in a hypertext, it is possible to link an annotation to a certain word and show it on a different screen or at any place with just one click. These are some advantages of hypermedia glosses over paper-based annotations. Likewise, the amount of studies the main concern of which is to investigate the effects of paper-based glosses and hypermedia glosses on the enhancement of vocabulary gain and comprehension of text have been increasing (Abuseileek, 2011; Bowles, 2004; Liu & Lin, 2011; Lyman-Hager *et al*., 1993; Melhi, 2014; Roby, 1991; Taylor, 2006; Yousefzadei, 2011). Some of these studies have been discussed throughout this section in detail.

As one of the earlier CALL studies, Bowles (2004) was in the pursuit of finding the differences between hypermedia glosses and paper-based glosses in terms of their influence on comprehension of a reading passage and learning of vocabulary in a foreign language. She decided to use think aloud protocols for attention measurement, comprehension, vocabulary production and recognition tasks to assess vocabulary and reading comprehension. Out of ninety-three English learners of Spanish language, fifty participants took part in the study and read a text from a Spanish newspaper under three different conditions; hypermedia gloss condition, paper-based gloss condition and control condition. After a pilot test, the researcher glossed some words in the text with English equivalents. The paper-based group had the glosses in the right margin on the printed text and the hypermedia gloss group could reach the glosses with a click on the highlighted words in the process of reading on computer, whereas the control group had the printed text with highlighted words but no glosses. Prior to the treatment, all of the participants were required to answer vocabulary recognition and production tasks as pretest. During the experiments the participants were asked to think aloud into a tape recorder while reading. After the experiment, the same vocabulary tasks were delivered as well as comprehension task. As a result, the experimental groups were different from control group in terms of attention to glossed words, the performances on comprehension and vocabulary tasks. However, no significant difference was discovered between paper-based gloss group versus hypermedia gloss group. Therefore, it can be easily inferred that glosses have been useful in the improvement of comprehension and new

vocabulary gain in this study even though there was no important advantage of hypermedia glosses over traditional paper-based glosses.

Nevertheless, there are some other studies the results of which conflict with Bowles' findings. To illustrate, Abuseileek (2008) explored whether using hypermedia annotations or traditional annotations would make a difference in the performances of EFL learners in vocabulary learning and reading comprehension. He also investigated the role of gloss location and learners' preferences of gloss location. Eighty Saudi students participated in the study. They were intermediate students studying at English Language and Literature Department at King Saudi University. The researcher selected seven texts from different stories based on expert opinion and learners' interests. The researcher collected data with pretest, posttests and a questionnaire. Some of the students used hypertext glosses during reading sessions while the others used traditional glosses in which explanations were at the bottom of text. As a result, it was reported that regardless of the locations where hypermedia annotations appeared, the learners reading with hypermedia glosses were significantly better at vocabulary and reading comprehension tests than the learners using traditional glosses. The preference results of the participants amazingly showed that nearly all of them preferred hypermedia glosses over traditional ones. However, in Bowles' study there was no meaningful difference between hypermedia gloss condition and traditional condition. This difference may result from the proficiency level of the participants since in Bowles' study learners had low proficiency in L2 whereas in this study the learners were intermediate students.

A much more recent study also explored the effectiveness of hypermedia glosses in comparison to traditional paper-based glosses. Melhi (2014) attempted to find out how effective a computer-mediated gloss can be for reading comprehension in an L2. The researcher used a quasi-experimental pretest-posttest design for this purpose and studied with a small number of participants. Thirty-eight students learning English as a foreign language at a university in Saudi Arabia were selected as participants of the research based on their performance in an IELTS test and their socio-economic status in order to ensure the homogeneity. Then the participants were separated into an experimental group receiving hypermedia glosses during reading process and a control group getting information about unfamiliar words from the teacher at the beginning of reading task. The researcher chose a reading text from the students' textbook and prepared it for experimental group by adding hyperlinks for unknown words. Both groups took a pretest measuring their prior knowledge of the topic and later, they read the text according to their treatments. The experimental group utilized the e-glosses while control group read the printed text and got no additional gloss.

With thirty questions in multiple-choice format, they were tested for their understanding of the text. It was found out that the learners provided with hypermedia glosses were significantly better at the posttest than the control group. With reference to the result, the researcher concluded that utilizing hypermedia glosses could be an indicator of enhancement in reading comprehension of EFL learners.

In another study, Liu and Lin (2011) examined the differences of using three types of glosses in vocabulary retention and reading comprehension. These types of glosses were "pop-up" version, "type-in" version and book dictionary. In pop-up gloss, learners needed to just double click on glossed word and then they got glosses immediately, in type-in gloss, learners needed to write the unfamiliar word on the search button and tried to find explanation for that word, whereas in dictionary type, learners needed to look up a paper-based dictionary for word definitions while reading a computerized text. Apart from these three types of gloss which formed the experimental groups, there was also a control group which did not take any information about unfamiliar words. Eighty Taiwanese university students learning English were included in the research. They were at similar proficiency levels. The learners were divided into four before mentioned groups. They read a text according to their groups and treatments, and their actions were video recorded during reading. Data collection instruments were a vocabulary matching test and a multiple-choice reading comprehension test. The analyses of the tests revealed that there were no meaningful differences among all groups including the control group in terms of text comprehension. On the other hand, concerning vocabulary gain the experimental groups got better results than control group whereas the pop-up group significantly outperformed the other two experimental groups. That means that hypermedia glosses have benefits over paper-based dictionaries with regard to vocabulary learning.

In conclusion, it is easy to see the differences in the results of the studies discussed. Depending on their research design, the proficiency levels of participants and assessment types, the results are slightly confounding. While the findings of some studies favor hypermedia glosses over traditional paper-based glosses, there are studies finding no significant difference between them in terms of improving vocabulary learning and comprehension. Besides, among the studies favoring hypermedia glosses, some find hypermedia glosses more helpful concerning vocabulary learning only whereas others find them more useful for comprehension. It is obvious that there is no general agreement about whether computer-assisted glosses or paper-based glosses are more effective on the development of reading comprehension and vocabulary learning.

Multiple-choice glosses.

Based on the Mental Effort Hypothesis proposed by Hulstijn (1992) multiple-choice glosses are thought to require inference and mental effort. Therefore, it is believed that with multiple choice glosses, the greater the mental effort, the better the retention and learning of vocabulary (Rott, *et al*., 2002). Alternatives for the unknown words are presented in multiple-choice glosses and learners are supposed to evaluate all of the alternatives and choose the correct one. Multiple choice glosses are different from single glosses as it has been pointed out by Yoshii (2009):

> Single translation glosses are ordinary, conventional glosses with one definition or one explanation of a word; on the other hand, multiple-choice glosses have multiple definition options—typically one correct definition of the word in question and three definitions of other words—and learners have to think about the meaning of the word and choose the best one that would fit the con- text where the word appears. (p. 205)

Learners are actively involved in the process of choosing the correct explanation of a target word in a multiple-choice gloss. That is why, Laufer and Hulstijn (2001) regard multiple-choice glosses as better than glosses with single explanations in terms of word recall. However, their hypothesis has not been confirmed completely by the studies in the field. Still there is no general agreement about the effectiveness of multiple-choice glosses over single glosses within the field of second language learning. Experimental data are rather controversial and inconclusive as it has been discussed in this section.

As a textual gloss type, some researchers have studied the effectiveness of multiple-choice glosses on vocabulary acquisition of L2 learners and reading comprehension as well. Nagata (1999) for instance, examined the efficiency of single glosses and multiple choice glosses by using Banzai readings, a Japanese courseware program. In the experiment, the participants were 26 American university students learning Japanese and were expected to read a text with 260 words and 26 glossed items in two different groups. Single gloss users were provided with an English translation of the target word whereas multiple-choice gloss group was given two possible translations and immediate feedback as a response to the participant's choice. To assess vocabulary acquisition, a translation test was administered after the treatment, and for the assessment of retention the same test was used four weeks later. According to the results of these tests, multiple-choice gloss was significantly more effective than single gloss in recalling vocabulary. Supporting these results, Duan and Yan's study (2004, as cited in Hong, 2010) investigated the impact of single glosses, multiple-choice glosses and no glosses. Their findings revealed that both gloss groups were better than no gloss group in terms of incidental vocabulary learning. Especially the participants in the

multiple-choice gloss group outperformed the single gloss group significantly.

Nagata's (1999) study was a computerized form of Watanabe's (1997) study but the results seemed to be slightly different because Watanabe (1997) recorded no significant difference between multiple-choice and single gloss. A similar finding was recorded by another study by Miyasako (2002). Comparing multiple-choice glosses and single glosses Miyasako conducted a study on 187 Japanese high school students. They were asked to read a 504-word reading passage with 20 glossed words in six groups of gloss: 1) L1 (Japanese) single gloss, 2) L2 (English) single gloss, 3) L1 multiple-choice gloss, 4) L2 multiple-choice gloss, 5) no gloss and lastly 6) No reading (control). Through two multiple-choice vocabulary tests; one of which was applied immediately after the reading and the other one was administered eighteen days later, the results showed that L2 gloss groups both multiple-choice and single one outperformed L1 gloss groups on immediate vocabulary test. For the delayed test, on the other hand, no significant difference was found between single and multiple-choice gloss groups in their impact on vocabulary gain.

Srichamnong (2009) also examined the impacts of the multiple-choice glosses on vocabulary learning of Thai learners of English as a foreign language. Since learners exposed to multiple-choice glosses could infer the meaning of the glossed words wrong, the researcher made multiple choice glosses interactive so that learners could check their answers and see whether they were correct or wrong during the experiment. The study was carried out with forty-five university students with intermediate level of proficiency. They were put into two separate groups, one of which got multiple-choice glosses while reading on computer, the other one got single glosses. Two texts were chosen as reading materials and eight words were glossed for each text. Multiple-choice gloss group had three options for the glossed words, which were a correct L1 translation, a somewhat related translation and an antonym in L1. The learners in that group had to choose an option to learn the meaning of glossed word. Because that gloss was interactive, they got an immediate feedback about their answers after they chose an answer. However, in single gloss group the participants were given L1 translation of the glossed word when they clicked that word without any choices. Data collection instruments were a pretest, a vocabulary posttest measuring production and reception levels of target words and a delayed vocabulary test. The findings of the study indicated that the learners reading with multiple-choice glosses were significantly better at both vocabulary posttest and delayed vocabulary test than single gloss group. It was asserted that words learned through interactive multiple- choice glosses were recalled longer.

In another study where learners were supported with feedback on their responses to multiple choice glosses just as Srichamnong's study; Yoshii (2009) conducted a study to

figure out which gloss type, either multiple-choice or single translation gloss, is better for enhancing EFL learners' vocabulary gain and retention. The sample of the study was forty-one Japanese college students learning English as a foreign language whose proficiency level was low intermediate. The participants were separated into two groups: multiple choice gloss group and single gloss group. Concerning multiple-choice gloss, the researcher prepared a web design including a reading text with four alternatives for each target word: one correct meaning in L1, two different words related to the context in L1, and another glossed word's translation in L1. As for single gloss, the translation in L1 was used for each target word. The participants read a computerized text and had access to glosses according to their treatments. Three posttests were administered to the learners to assess their learning of target vocabulary and retention of that vocabulary. One of these tests was applied after reading immediately; the second test was applied a week later while the third one was handed out a month later. The posttests were all the same except the order of questions. The analyses of the data demonstrated that in contrast to the prior results single gloss group were surprisingly more successful than multiple-choice gloss group in each vocabulary test. The study gave feedback to the learners for their responses after they finished reading. As the learners got feedback for all of the target words at the end as a whole, they could not understand the correct translation of each target word while they we engaged with reading material. That might explain the reason why multiple-choice gloss group had lower scores at vocabulary tests as it was suggested by the researcher.

For further discussion, Farvardin and Biria (2012) examined the impact of glosses on reading comprehension in Iranian context. 120 university students majoring in English teaching were randomly assigned to three kinds of glosses which are single gloss in L1, single gloss in L2 and multiple-choice group in L2. As in the previous studies a reading text was given in one of these three conditions. The results indicated that multiple-choice gloss group had better scores than single gloss in L2 group in vocabulary learning, yet single gloss in L2 group was the best in reading comprehension. In a recent study, Gan (2014); on the other hand, investigated the influence of multiple-choice glosses compared to single glosses on vocabulary learning. Studying with seventy-five university students under three different groups, multiple-choice, single gloss and control group, the researcher used vocabulary recognition and production tests after the participants read an article. The results indicated that multiple-choice gloss group significantly outperformed single gloss group and control group in both tests. Considering the aforementioned studies on the effectiveness of multiple-choice glosses it can be stated that the results are slightly mixed and confusing. Nevertheless, in order to be able to generalize research findings in the literature, we need more empirical

studies that will be conducted with larger samples and reliable assessment instruments, and also that will consider learners' behaviors as well as their thinking process during reading and their attitudes toward multiple-choice glosses.

Multimedia glosses.

With the integration of computer and technology into the second language learning and teaching, and the increasing importance of Computer Assisted Language Learning approach, glosses has been equipped with one or more media features (text, image, sound, still pictures, animations, video) to assist language learners in vocabulary learning. Thus different media features in different combinations have been added to glosses and formed multimedia glosses. For two decades, researchers have been interested in searching for the effectiveness of various types of multimedia glosses on enhancing reading comprehension and incidental vocabulary learning in a second or foreign language. In this section, some of the studies investigating the role and effects of multimedia glosses have been discussed and reviewed according to whether they examine their effects on vocabulary learning only or reading comprehension only or both. The studies mentioned below are included in this chapter either because they are the most cited and important studies in the literature or because they are the most recent and relevant studies.

Multimedia glosses and vocabulary learning.

In the literature multimedia glosses were generally investigated in terms of their effects on L2 vocabulary learning. In these studies, different combinations of multimedia components were formed by researchers, and their effects were investigated through an experimental study on learners of second or foreign language with different levels of proficiency in various contexts.

Chun and Plass (1996a)'s study is a noteworthy example of the studies of multimedia glosses. They conducted several studies with the same purpose through an application called CyberBuch which was developed by the researchers themselves. The application provided learners of German to read German stories with annotations supplied for difficult words in different forms of text, video, picture. The study was carried out with one hundred and sixty students learning German at three different universities in California. The learners read a story using the application, selected the annotation they wanted during reading and finally took a vocabulary recognition test. The results of the study demonstrated that learners recalled more words when they used text and picture annotation together than when they used text annotation only or text and video annotation together. Two years later Plass, Chun, Mayer and

Leutner (1998) examined the impacts of multimedia glosses on vocabulary learning again. They conducted the study on 103 American university students learning German as a second language. Similarly, the participants were required to read a text on computer with 24 target words. Half of these words were supplied with text and picture glosses whereas the other half were glossed with text and video. In the vocabulary test the participants were supposed to give L1 translations of the target words. The results showed that the target words with text and picture glosses were remembered more than the ones with text and video glosses. These two subsequent studies conducted by the same researchers showed the same results and text+ picture glosses were found to be more effective than text or text+ video glosses on L2 vocabulary gain and recall. Moreover, text+ picture and text+ video glosses were found to be more helpful than text gloss. The findings of these studies support Dual Coding Theory as the words coded in two modes (text+ picture or text+ video) were remembered more than the ones coded in only one mode (text). However, the text+ picture gloss was superior to text+ video gloss. As an explanation for that result, the researchers suggested that since videos were short and dynamic than pictures which were of fixed quality, the establishment of the information in videos in long term memory might be more difficult.

Another similar study to Plass *et al*. (1998) was carried out by Al-Seghayer in 2001 in order to compare the effects of pictures and videos on enhancing vocabulary learning. The number of the participants was less than the one in Plass, Chun, Mayer and Leutner's (1998) study. 30 college students studying English as a second language participated in the study and read a narrative English hypertext with 21 target words. The words were divided into three groups equally: seven words were glossed only textually, seven words were provided with text and picture gloss and seven words with text and video gloss. Both recognition and production tests were used to assess vocabulary learning. Based on the test results, text plus video gloss condition and text plus picture gloss condition were better than text only condition. Moreover, the target words glossed with video and text were better recalled than words glossed with text and picture, which was contrary to findings of the aforementioned study. This may be caused by the difference between L1 and L2 of the participants in the two studies as suggested by Al-Seghayer (2001).

Exploring the influence of multimedia glosses on incidental vocabulary learning, Yoshii and Flaitz (2002) compared the effects of three types of gloss: text-only gloss, picture-only gloss and text plus picture gloss. 151 adult English language learners from 38 countries speaking one of eighteen languages and learning English in the English Language Institution at the University of Florida were the participants of the study and randomly assigned to one of the three gloss types. After reading an online story with 14 glossed words, the participants

completed an immediate vocabulary test, a definition supply test, a picture recognition test and a delayed vocabulary test. According to the results of the study, the participants exposed to the combination of text and picture gloss outperformed those exposed to the text-only gloss and picture-only gloss. In Iranian context, a very recent study conducted by Moradan and Vafei, (2016) intended to find an answer to the same question. Three types of glosses- textual, pictorial and textual+ pictorial were compared in terms of their effectiveness on the improvement of vocabulary acquisition in a second language. Differently from Yoshii and Flaitz's study, the researchers studied with younger learners of pre-intermediate English proficiency level. Out of seventy learners of English, forty-five learners whose first language was Persian were selected based on their performances on a proficiency test. The reading texts were glossed under one of the gloss conditions for treatment. The study was not carried out on a computer environment. The pictures for target words were printed and taught by the researchers while learners read the texts. The treatment was accomplished in ten sessions. After reading the texts in different sessions, the participants completed a vocabulary test with 30 items. The analysis of the data revealed a significant difference between textual+ pictorial gloss group and the other groups. This finding is in line with Yoshii and Flaitz's results and confirms the Dual Coding Theory which proposes that learning would be promoted when the input is presented in two different modes; verbal and visual.

In addition to the effects of visuals in annotations, Yeh and Wang (2003) also included audio pronunciations of the target words into their annotation study. They investigated the effects of three types of annotations on vocabulary learning: text-only, text+ picture and text+ picture+ audio pronunciation of the words. They also examined whether learning styles of the participants had any effect on the influence of a certain annotation type. As the participants of the study, 82 Taiwanese university students learning English as a foreign language took a pre-test asking for the definitions of the target words accompanied by a questionnaire on learning styles and read a hypertext in one of the annotation groups. To assess the effectiveness of the annotation types on vocabulary learning, a post-test consisting of multiple-choice questions and word association questions, and a cloze test were administered fourteen days after the pre-test. No significant differences were found between text-only annotation group versus text-picture annotation group or text-picture-audio annotation group. However, the text-picture annotation group was found to outperform the text-picture-audio group. Even though the researchers explained why the audio annotations did not have any positive effect on vocabulary learning by claiming that Chinese learners appeared to prefer visual stimuli more than auditory stimuli, the results of the learning style preference questionnaire did not

demonstrate any significant difference on the influence of annotation types for the learning of target words.

In 2011, Zoi, Bellou and Mikropolous studied the influence of mediated annotations on vocabulary gain with a much less investigated participant group, elementary school students. The first language of the students aged ten or eleven was Greek, and they were learning German as a foreign language. The researchers designed a web-based reading including words annotated with four different ways: 1) interpretation of the text in L1, 2) L2 definition, 3) aural definition in L1 and 4) a picture. The thirty-one participants were exposed to the treatment in a multimedia environment, and each studied on their own by choosing which type of annotation they wanted to use. With a click on annotated words, the students got the annotation assistance and read the text selected from their course-book at their own speed. After reading the text they interacted with some vocabulary activities involving gap-filling, multiple-choice, short answer questions. In addition, the participants' reactions and preferences were examined through a survey. The results of the vocabulary activities showed that the majority of the students were successful on the tasks except some spelling errors they made in gap-filling exercise. Their reactions against multimedia annotations were also positive, and they would rather have aural definitions. The outcomes of this study confirm Yun's (2011) claim in his meta-analysis study suggesting that vocabulary development is promoted more for beginner level learners through the use of gloss.

Multimedia glosses and reading comprehension.

While many of the researchers generally focus on vocabulary learning in multimedia glosses, there are also some researchers that have investigated the effects of multimedia glossing on only reading comprehension. One of these researchers, for instance, Lomicka (1998) examined the way multimedia glosses affected the comprehension level. The study included a small number of participants who are 12 university students learning French as a foreign language. They were assigned to three groups, each receiving a different treatment: traditional glossing (definition in L2 and translation in L1), full glossing (definition in L2, translation in L1, image, pronunciation, reference, and question) and no glossing. The participants read a French poem and completed think-aloud protocols. As a result, it was reported that full glossing enhanced the level of text comprehension. Besides, there was a tendency to prefer traditional gloss among the participants in general, even those who had access to full glossing.

In a later study, Erçetin (2003) explored how proficiency level affected the preferences of the learners to choose and use different types of annotations, and their attitudes towards

hypermedia reading. She studied with 84 adult intermediate and advanced level ESL learners for academic purposes from different nationalities at a US university. Both quantitative and qualitative data were collected through a comprehension test, a tracking tool, interviews and a questionnaire. The learners were asked to read a text including annotations in the form of text, picture, sound and video, and to choose the type of annotations they preferred while reading. The data from the tracking tool indicated that intermediate level learners used annotations more frequently than advanced group. This finding strengthens Knight's (1994) view that learners look up less frequently as their proficiency level improves. However, advanced group performed higher in the comprehension test. Also, text and picture annotations were preferred more than videos by both advanced and intermediate level learners. As for the interview and questionnaire results, hypermedia reading and glosses were considered to have a positive effect on the learners' attitudes. Davis and Lyman-Hager's study (1997) had a similar attitude result since computerized glosses were found to be "helpful", "time-saving", enjoyable", and "easy" by the most of the participants.

One year later, Erçetin extended her study and analyzed the same data with Ariew (2004) from a different perspective. In this study they investigated the effects of different types of glosses on reading comprehension which was different from the earlier study (Erçetin, 2003) focusing on the preferences and behaviors of L2 readers engaged with hypermedia annotations. The analyses revealed that reading comprehension was not enhanced by annotation use for both intermediate and advanced groups. Furthermore, for intermediate group there was a negative relationship between reading comprehension and the time they spent on non-textual annotations.

In Turkish context, Sakar and Erçetin (2005) conducted another study on 44 university students learning English for academic purposes to investigate whether multimedia annotations aided reading comprehension. The participants read an authentic text with 104 textual annotations twice. The annotations included definition of the target words, pronunciation and sometimes pictures. After reading, the data were collected through a comprehension test with multiple-choice and open-ended questions, interviews and a questionnaire. The findings showed that visual annotations were preferred more than textual and audio annotations. Negative relationship was found between audio, video glosses and reading comprehension. On the other hand, no relationship was detected between the other types of glosses and reading comprehension. The researchers suggested that audio and video annotations affected reading comprehension negatively since these annotations seemed to distract the participants and thus, hinder text comprehension. A similar result was reported by Chun and Plass (1996a) suggesting that different combinations of media may not be that

much effective, and learners' attention may be distracted from getting the meaning by motions in videos.

In another study by Marzban (2011) the effects of audio and video glosses on reading comprehension were investigated. The study was carried out on eighty participants with pre-intermediate level of English proficiency depending on their performances on the Nelson English Language Test. The participants were separated into two groups. The first group read two texts chosen and annotated with either audio or video features by the researcher whereas the second group read the same texts on paper with a dictionary. Their comprehension of the reading materials was assessed through a ten-question multiple choice test. The mean scores of the test demonstrated that there was a significant difference between the first and second group. The group receiving audio and video glosses significantly outperformed the group using dictionary in terms of reading comprehension. The results of this study contradicts with Ariew and Erçetin (2004) and, Sakar and Erçetin (2005)'s studies. While their studies found negative effects of audio or video glosses on reading comprehension, Marzban's study found positive effects of those glosses on reading comprehension. The proficiency levels of participants and the assessment methods were more or less similar in these studies, however they have contradictory results. While Marzban suggested that his finding supported the Cognitive Theory of Multimedia Learning since activating both auditory and visual working memory resulted in better performance in reading test, Ariew, Erçetin and Sakar asserted that audio and video glosses distracted attention and hindered the understanding of reading materials.

A study conducted by Shalmani and Sabet (2010) supported Paivio's Dual Coding Theory (1986). They examined the impacts of textual, pictorial and textual+ pictorial glosses in aiding understanding of L2 reading passages. Choosing their participants from a university in Iran based on their scores in a proficiency test, the researchers decided on using five academic texts. One hundred and twenty participants were divided into three experimental and one pilot group. In just one session they were required to read the short passages and answer reading comprehension questions relevant to the passages. As for the findings, a significant difference was observed among the three treatment groups. The mixture of textual and pictorial group was the most successful group and significantly outperformed the two other groups, textual and pictorial groups respectively. Therefore, the researchers have suggested that since pictures are easy to remember and catch attention, learners might be curious about the topic and concentrate more on reading materials, which might yield deeper understanding. With both textual and pictorial annotations, learners activated both their

verbal and visual memory and thus cognitive load was reduced. Consequently, working memory could have more capacity to process reading materials in terms of comprehension.

Alessi and Dwyer (2008), on the other hand, investigated the impact of hypertext glossing on reading comprehension from a different perspective. They asked 76 American learners of Spanish to read a Spanish newspaper article in four different conditions. One group of the participants got a pre-reading activity (practice on the important vocabulary in the text), the second group got during-reading assistance (L1 translation in hypertext glossing), the third group took both pre-reading activity and during reading assistance, and the fourth group got no help. The results revealed that the reading comprehension of the participants receiving during-reading help was significantly better than the participants provided with pre-reading activity.

As another study examining the influence of multimedia annotation on reading comprehension from a different perspective, Huang (2014) added discourse scheme and summary writing into multimedia gloss study. The aim was to actively involve learners into reading process. The researcher completed his study with one hundred college students enrolled in General English Course in Taiwan. The participants were assigned to four groups receiving different treatments. Group 1 had no treatment, group 2 received multimedia annotation and group 3 got summary writing whereas the last group had both multimedia annotation and summary writing. While reading an article the learners were supported with a discourse scheme for multimedia annotation. After the learners read the texts according to their treatment groups, they were asked to answer a reading comprehension test. There was also a delayed post-test and interview. According to the analyses of the data, both group 2 and group 3 were significantly better in the comprehension posttest. However, as for delayed post-test results, group 3 receiving the treatment of summary writing was the best. Interestingly group 4 which was the combination of treatments given to group 2 and 3 was not as successful as group 2 and 3 individually. The rationale for this result provided by the researcher depending on interview analyses was that the learners in group 4 found their treatment cognitively demanding too much and confounding.

Multimedia glosses, vocabulary learning and reading comprehension.

Recently, the researchers examining the effectiveness of multimedia glosses have a tendency to study their effects on vocabulary learning as well as reading comprehension. As one of these studies, Yanguas (2009) explored three types of multimedia glosses which were textual, pictorial and textual plus pictorial, and their effects on L2 reading comprehension and vocabulary learning. Different assessment methods were applied on 94 Spanish college

students who read a text in three multimedia gloss conditions and no gloss conditions. They were asked to think aloud while reading, and besides a vocabulary recognition test, a production test was also utilized in pre-posttest design. The participants in all experimental groups had better scores than the control group in the tests. As for the production test; nevertheless, no significant difference was found. Finally, the outperforming group in reading comprehension was the combination group that had access to both text and picture glosses. The results of the study show different effects of multimedia glosses for reading comprehension and vocabulary gain respectively.

Tabatabaei and Shams (2011) obtained similar results with Yanguas' study (2009). Their aim was also to investigate the effects of three gloss types: textual, pictorial and textual+ pictorial gloss on both text comprehension and vocabulary learning. However, they conducted their research on 60 Iranian high school students reading an L2 computerized text under different gloss conditions. Their study indicated that all multimedia gloss groups were better at reading comprehension and vocabulary retention than the control group. But the combination gloss group was the best at reading comprehension. In a later study, Tabatabei and Mirzaei (2014) examined the impact of the same gloss types on idiom learning and text comprehension. This time they made the research at tertiary level and studied with sixty female students selected out of 141 volunteering students based on their scores on a proficiency test the researchers administered. After the researchers ensured the homogeneity of participants with regard to proficiency levels, with a random sampling the participants were separated into three experimental and one control group. Each experimental group read three texts where idioms were glossed and hyperlinked. During reading, a new window was opened, and students got the gloss type (textual, pictorial and combination of text and picture) appropriate to their group after the students clicked on the idioms hyperlinked. Both multiple-choice comprehension and idiom production tests were distributed to the students. They could go back to the texts while answering the test. Results of the tests showed that all types of glosses had a significant effect on text comprehension and idiom learning compared to control group. As for the question which type of gloss had a more significant difference on text comprehension, the textual plus pictorial group performed better than the other two gloss groups but the difference was insignificant. The results of this study are compatible with Tabatabei and Shams' earlier study. These studies both found combination of textual and pictorial glosses useful in promoting reading comprehension and vocabulary learning, which supports Dual Coding Hypothesis.

A recent study carried out by Zarei and Mahmoodzadeh (2014) examined the effects of the most studied gloss types (textual, pictorial and textual plus pictorial) on reading

comprehension and vocabulary production. The study was conducted on only sixty-five female students of a high school in Iran after a proficiency test was administered to one hundred and four female students. The participants who were divided into a comparison and three experimental gloss groups read two passages from a textbook with 9- 11 words glossed by using Power Point. A multiple-choice test for the assessment of reading comprehension and a fill-in the blank test to measure the participants' production of the target words were utilized in the study. The analysis of the tests revealed that in comparison to control group, the treatment was effective on vocabulary production; however, there was no meaningful difference among the three glossed groups on vocabulary production. Besides, there were no significant differences between three glossed groups and the control group on reading comprehension, which contradicts with the findings of Tabatabaei and Shams (2011).

Most of the studies investigating the role of multimedia glosses concentrated on the comparison of textual, pictorial and combination of textual+ pictorial glosses, Akbulut (2007); on the other hand, added another media form into glosses; videos. In Turkish context, he intended to seek the effectiveness of textual, textual+ pictorial and textual+ video glosses on the enhancement of vocabulary retention and reading comprehension skills of advanced learners of English. While selecting the reading material, students' opinions were considered. A text suitable to their interest was incorporated into software and target words were determined and highlighted on the text with a pilot study. After the researcher decided on the pictures and videos to be used to annotate target words depending on some expert opinions, the software was completed and ready to be accessed. Sixty-nine participants enrolled in English Language Teaching Department at Bogaziçi University read the text under one of the glossing types. The learners completed vocabulary tests consisting of multiple-choice questions, writing translations and word recognition and comprehension questions involving true-false as well as multiple choice questions. The study had different findings in terms of vocabulary acquisition and reading comprehension. There was a significant difference in favor of the textual+ pictorial gloss over the textual and textual+ video glosses with respect to vocabulary learning whereas no meaningful differences were detected in the measurement of reading comprehension.

Gasigijtamrong (2013), on the other hand, conducted a study to investigate the effects of multimedia glosses on L2 reading recall and vocabulary recall in Thai context. The study is one of the few studies examining the effects of sound annotations on both L2 vocabulary learning and reading comprehension. The effects of four types of multimedia annotations which were L1 definition, L2 definition, sound and picture were explored on seventy-eight pre-intermediate learners of English at college level in this study. Data were collected

through pretest and two production posttests. The learners were requested to read a hypertext with words annotated with definition, image and sound. They were also asked to select the type of annotation for each target word while reading, and their selections were recorded on the computer log files. After they finished reading, they were asked to write the meanings of the target words as a vocabulary posttest and to write about what they had read as a reading recall test. The analyses of data indicated that there was a positive impact of multimedia glosses on word recall in general; however, the difference between the types of multimedia glosses over reading recall and word recall was not significant. The words with pictorial glosses were recalled more than the words with no picture annotation. The findings of this study correspond to the dual channel assumption of the Cognitive Theory of Multimedia Learning which suggests that information is processed in two separate channels namely verbal/auditory and visual/pictorial in human mind, and learning happens best if information is processed in dual channels.

In addition to picture gloss, Al Ghafli (2011) included animation gloss in his study in order to teach technical terms for the students in petroleum engineering in Saudi Arabia. The researcher formed three gloss conditions: (i) textual, (ii) textual and pictorial (still pictures) and (iii) textual and animation (dynamic pictures). Two hundred and twenty-two participants read an English story online under one of the experimental gloss conditions. Data were collected with multiple-choice vocabulary, reading comprehension tests and a questionnaire. The results revealed that the multimedia gloss with dynamic pictures was more effective in supporting reading comprehension and vocabulary retention. However, no significant difference was found among the three gloss types in term of comprehension of the text and the retention of vocabulary. The result of the questionnaire, on the other hand, indicated that learners in the textual and animation group preferred online reading over paper-based reading more than the learners in the textual group did.

In addition to the type of glosses such as textual, pictorial, sound, animation and video, some researchers explored a different aspect of the multimedia glosses and their effects on text comprehension and vocabulary learning. They studied the effects of the way multimedia glosses were displayed. Abraham (2007) and, Türk and Erçetin (2014) are among those researchers. To illustrate, Abraham (2007) examined the effects of textual and pictorial (picture, video) glosses on L2 vocabulary learning and text comprehension. However, in addition to a control group the researcher formed two experimental groups which had access to both textual and pictorial glosses. One of these groups received both types of glosses simultaneously while the other group had the right of choosing the type of glosses to be accessed during reading a literary text. The participants of the study were one hundred and

two learners of Spanish. All of them were taking an intermediate-level Spanish course at a university in the United States. After random sampling the participants read a Spanish text with eighty-five annotated words under three conditions. The learners were required to write English translations of the annotated words and summary of the text after they finished reading. The analyses of the data demonstrated that there were significant differences between experimental groups and control group with respect to vocabulary learning and reading comprehension; however, the difference between experimental groups were not meaningful.

Another recent study conducted by Türk and Erçetin (2014) also investigated whether simultaneous or interactive display of multimedia glosses has different effects on the comprehension of a reading text. The main concern of the study was on the learners' control over choosing the gloss types in a reading task. In the simultaneous demonstration of multimedia gloss, the learners were presented both visual and textual gloss at the same time whereas in interactive demonstration version, the learners had the opportunity to choose between visual or textual glosses. The study was carried out with eighty-two high school students who were divided into two groups; interactive and simultaneous groups. The participants read an article and answered vocabulary and comprehension tests. The results of the tests demonstrated that the participants taking simultaneous demonstration of picture and text annotations were more successful both on vocabulary and comprehension tests. In addition, the learners reading with interactive glosses consulted them less. These results lead to consider the simultaneous demonstration of both verbal and visual information as a more effective way of presenting multimedia glosses, the rationale of which is based on Mayer's Generative Theory of Learning (1997) because the load of working memory is cognitively reduced with the simultaneous demonstration. Although research has shown that when learners have control in choosing data in multimedia learning, they become more autonomous and more motivated; since the proficiency level of the students were low in this study, they might be lacking on utilizing glosses effectively for their learning and hence they used interactive glosses less.

CHAPTER THREE

Methodology

This chapter explains the methodology adopted in the current dissertation in detail. The first section presents the research questions of this study while the second section provides explanation about the research design. The participants of the study are introduced in the third section whereas the materials used for data collection are addressed in the fourth section. Then the fifth chapter continues with the description of data collection instruments one by one in detail. How these data were collected through the materials and tools are thoroughly mentioned in the sixth section and finally, the sixth chapter ends with the discussion of how the data were analyzed in general.

Research Questions

The major goal of this dissertation is to explore the impacts of three different combinations of mediated glosses on reading comprehension and vocabulary learning of EFL learners. Its secondary goal is to investigate whether there is any significant effect of different texts using multimedia glosses on reading comprehension and vocabulary learning performances of upper-intermediate learners of English. The mediated gloss types to be investigated include three modes:

i. text (L2 definition of target word, an example sentence in L2 and L1 translation)
ii. text and picture (L2 definition, an example sentence in L2, L1 translation and a picture)
iii. text, picture and audio (L2 definition, an example sentence in L2, L1 translation, a picture and pronunciation of the target word along with its definition.)

The following research questions will be addressed in this study:

1. Does exposure to different mediated glosses have any significant impact on L2 reading comprehension of native Turkish speakers?
2. Does exposure to different mediated glosses have any significant impact on L2 vocabulary learning of native Turkish speakers?

2.1. Which mediated gloss type(s) has significant impact on L2 learners' vocabulary learning measured by an immediate vocabulary test?

2.2. Which mediated gloss type(s) has significant impact on L2 learners' word retention measured by a delayed vocabulary test?

2.3. Is there a significant difference between L2 learners' immediate vocabulary scores and delayed vocabulary scores?

2.4. Is there a relationship between the number of access to glosses and vocabulary learning as well as retention?

3. Does exposure to mediated glosses in different text genres have any significant effect on L2 reading comprehension and vocabulary retention of native Turkish speakers?

3.1. Does exposure to different glossed text genres have any significant effect on the L2 learners' reading comprehension?

3.2. Does exposure to different glossed text genres have any significant effect on the L2 learners' word retention?

4. How are the attitudes of L2 learners towards the mediated glosses?

4.1. Is there a significant difference among the experimental groups regarding L2 learners' attitudes towards the mediated glosses accessed during the treatment?

5. What are the opinions and experiences of L2 learners about the treatment?

Research Design

This study aims to investigate the impacts of multimedia glosses on fostering L2 learners' vocabulary learning and reading comprehension. In this respect, the study followed mixed methods research methodology that utilizes both quantitative and qualitative methods in order to get a better understanding of the research problem. Instead of using only one method, either quantitative or qualitative, this study combined both quantitative and qualitative methods that provided a strong framework to explore research problem thoroughly and deeply than either method alone (Creswell, 2012).

Mixed methods research is defined by Creswell (2012) as "a procedure for collecting, analyzing, and mixing both quantitative and qualitative methods in a single study or a series of studies to understand a research problem" (p. 535). Mixed methods research gives a researcher the opportunity to investigate research problem from the perspectives of both methods and complement the results with one another (Teddlie & Tashakkori, 2009). In addition, just one research method may not be sufficient for explaining some social phenomena. In this case, combining both methodologies enables a researcher to gain an in-

depth understanding of a phenomenon. Thus, mixed methods research provides the opportunity to compensate weaknesses of both quantitative and qualitative research. There are also some other reasons to use a mixed methods research as suggested by researchers (Bryman, 2006; Greene *et al*., 1989). Some of these reasons are as follows:

- *triangulation* (to correspond, converge, corroborate the findings from different methods, data sources and perspectives)
- *complementarity* (to explain, elaborate, illustrate the findings of one method with the findings from other method)
- *development* (to utilize the findings from one method to construct the other method including sampling, instruments and intervention issues).
- *initiation* (to change the research questions and findings of one method as a result of emerging contradictions and differences in research problem with the other method)
- *expansion* (to extend the breadth and depth of a research by employing different methods for different research factors)
- *credibility* (to increase the integrity of research findings by using both research methods
- *illustration* (to demonstrate quantitative results by using qualitative data)
- *diversity of views* (to mix participants' and researchers' views by using qualitative and quantitative research to understand different perspectives of the same phenomenon).

This study followed a mixed methods research for triangulation and complementarity reasons. In terms of complementarity, using both quantitative and qualitative methods contributed to the understanding of the impact of multimedia glosses on L2 learners' vocabulary learning and reading comprehension since the findings from qualitative method helped to explain the findings from quantitative method. As for triangulation, this study focused on the similar research questions in both methods and similar findings were obtained. Therefore, validation of both quantitative and qualitative findings was ensured.

The presence of very few studies conducted with mixed methods in the relevant literature to investigate the effectiveness of mediated glosses on L2 learners' vocabulary learning and reading comprehension is one of the main reasons of adopting a mixed method research in this study. In this regard, the present study attempted to combine quantitative research with qualitative research to increase the in-depth understanding of the effectiveness of multimedia glossing with a more comprehensive account of the research outcomes.

There are various types of mixed methods designs. In order to choose an appropriate mixed methods design, there are some important questions to be answered. These significant questions mentioned by Creswell (2012) are about:

i. which data collection and analysis method (qualitative and/or quantitative) is given *priority* in a study. More significance and attention may be given to one type of data; or both types of data may get equal emphasis. This dissertation; for instance, focused more on quantitative data collection and analysis than qualitative data collection. More quantitative data were gathered in this study through different measurement tools and hence, more statistical analyses were carried out in comparison to qualitative data analysis methods. Qualitative data were collected for the purpose of complementing the research outcomes and had a supportive role in the present research.

ii. in what *sequence* quantitative and qualitative data is collected. A researcher should decide on what kind of data is to be gathered first and what kind of data is to be collected later or simultaneously. According to Creswell and Clark (2011) there are three timing or sequence types used in mixed methods design. The types include *concurrent, sequential* and *multiphase combination*. In concurrent mixed methods designs, quantitative and qualitative data are collected simultaneously whereas in sequential designs, the collection of one form of data is followed by the other form of data collection. In multiphase combination designs, on the other hand, the researcher uses multiple phases involving concurrent and sequential designs during a mixed study. The current study used a sequential mixed methods design because first the quantitative data were collected, and then qualitative procedures were followed.

iii. how *data analysis* is carried out by the researcher. In a study the researcher needs to decide on whether to integrate the data in one analysis or hold the data analyses separate. In the present research, the data were separated in the analysis procedure. First quantitative data were analyzed and then, qualitative data were distinctively analyzed as independent from quantitative data.

iv. *where* the collected data were *mixed* and interacted in a research. The researcher needs to determine at what stage both forms of data are linked and integrated. "The two forms of data might be combined, linked or mixed during data collection, between data collection, between data collection and data analysis, during data analysis, or in the interpretation of a study" (p. 540). As for the place of mixing the two forms of data, since the researcher first analyzed quantitative data and then presented qualitative data for complementary purposes in this study, both data types

were mixed in the discussion part of the study so as to make interpretations about the outcomes.

In brief, in order to conduct a mixed methods research it is crucial to choose a proper design considering the aforementioned issues. In this study the researcher conducted a mixed methods research by giving priority to a quantitative method (experimental study), using qualitative data to support the quantitative results, following a sequential order in data collection, keeping data analyses separate and mixing the two data types in the interpretation stage. In this regard, the researcher adopted *the embedded design* out of six types of mixed methods designs (i.e. the convergent parallel design, the explanatory sequential design, the exploratory sequential design, the embedded design, the transformative design, and the multiphase design) in this doctoral study.

As stated by Creswell (2012) the purpose of embedded design is "to collect quantitative and qualitative data simultaneously or sequentially, but to have one form of data play a supportive role to the other form of data" (p. 544). In the studies using this design a secondary form of data (i.e. qualitative data) is added into a major form of design (i.e. experimental design). Therefore, priority is not given to the two forms of methods equally. The emphasis of the study is on one form of research method while "the secondary form is used in the mixed methods study to support and provide additional information to the primary form" (p. 545). Besides, the analysis of both quantitative and qualitative data is conducted and kept separately in this kind of mixed methods designs. To conclude, this type of design integrates the benefits of both quantitative and qualitative approaches while the emphasis of entire design is still on one form of research approach. That is why, the present study adopted the embedded design among the other types of mixed methods designs. In order to answer research questions, the researcher first collected quantitative data through an experimental study which was the primary design of the research and later collected qualitative data as secondary form. The qualitative data were embedded into a quantitative design to support and augment the primary form of data (Creswell, 2012). In line with the processes included in the embedded design, this research was conducted in two phases.

In the first phase of this research based on quantitative research methods, an experimental research design (the randomized posttest-only control group design) as explained by Büyüköztürk *et al*. (2011) was adopted to compare the effects of three different combinations of electronic glosses on English vocabulary learning and reading comprehension. These three experimental conditions are as follow:

a. textual glossing (L2 definition of glossed word, L1 translation and an example sentence in L2)

b. textual and pictorial glossing (L2 definition, L1 translation, an example sentence in L2 and a picture)

c. textual, pictorial and auditory glossing (L2 definition, L1 translation, an example sentence in L2, a picture, and the pronunciation of the glossed word as well as its definition.)

In the second phase based on qualitative research methods, semi structured interviews with a small number of participants were carried out to examine how participants in the experimental groups experienced the intervention. To have a deeper understanding about the impact of mediated glosses on L2 learners' vocabulary learning and reading comprehension, the process participants went through and their opinions needed to be considered. This could have been understood only by following a qualitative research method. Therefore, qualitative data were collected about the participants' experiences, perceptions, and attitudes toward the treatment through interviews and a questionnaire as a facilitator and supportive of quantitative outcomes.

Figure 4 illustrates the flow of design adopted in this research based on the illustration of embedded design from Designing and Conducting Mixed Methods Research by Creswell and Clark (2011).

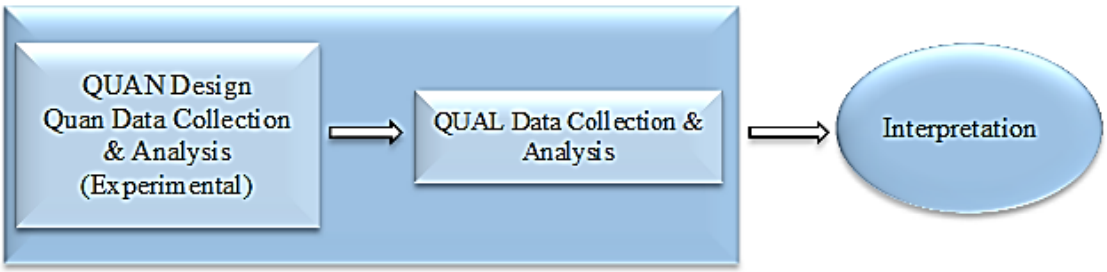

Figure 4. The design phase of the study.

The combination of both quantitative and qualitative results from this study contributed into the researcher's understanding of the effects of multimedia glossing on L2 learners' reading comprehension and vocabulary learning.

Participants

The study was conducted in a foreign language education setting, at the Department of Foreign Language Education at Ataturk University in Erzurum, Turkey. The choice of conducting the study at Ataturk University was based on practical considerations such as geographical closeness, easy access to treatments and volunteering participants meaning that

convenience sampling was adopted in the present study. The experiment was carried out with 119 undergraduate sophomore and junior students majoring in ELT program, where the medium of instruction is English. All of the participants except one student were Turkish and were non-native speakers of English. Table 5 indicates some of the demographic information of the participants on group basis.

Table 5. *Demographic Data of the Participants (number, mean of age, gender, grade level)*

Groups	**N**	**Age mean**	**Gender**		**Grade**	
			Female	Male	2	3
Group A	30	22	23	7	10	20
Group B	30	21	26	4	20	10
Group C	30	21	20	10	26	4
Group D	29	22	24	5	13	16

The aim of the participants having education at that department was to be English language teachers in Turkey. The researcher did not have the opportunity to observe the participants' performances or grades in their classrooms before the study. Thus, before conducting the study the participants were administered a demographic and background questionnaire to have more information about them (see Appendix I). The participation in the study was voluntary. The students were told that the participation would not have any effect on their performances in the class, and their responses as well as identifications would be kept confidential.

Participants' proficiency was assessed and determined according to three criteria: department's proficiency test, background questionnaire, and vocabulary knowledge test. The first criterion is that learners take an English proficiency test at the university which measures their English level at four skills. They need to take at least 60 points, which is equivalent of B level in this test including all skills to be able to have training in the department. If they cannot prove that their English language level is adequate through this placement test, then they are required to take preparatory training in English and score minimum passing grade in the midterm and final exams during the training. After passing these exams, they can start their undergraduate studies in the ELT program, meaning that the learners need to have a sufficient English proficiency to be admitted to the department and program. Furthermore, the participants took at least ten English undergraduate courses which constitute thirty credits before they participated to the study. Among these courses there were two Advanced Reading

and Writing courses along with one Vocabulary course, which is directly linked to the skills measured in this study. Considering the learners' courses and entry requirements of ELT department, it can be considered that the participants' proficiency levels were of upper-intermediate level, and the participants were likely to have similar English language proficiency.

Secondly, learners were asked about their grade point of average and their proficiency level in the background questionnaire conducted with the participants beforehand. Learners also responded additional questions related to their English language proficiency such as when they started to learn English, how long they studied English, and how they rated their overall proficiency in English. The responses to these questions indicated how different the participants were from each other. The participants' responses in the questionnaire were considered in the process of data analysis.

Lastly, to be sure that the learners were unfamiliar with the target words, a vocabulary checklist (in Appendix D) was administered to them before conducting the study. They were asked whether they knew these words and to provide English definitions or Turkish equivalents of the words in the list. Perez *et al*. (2014) determined a criterion for the exclusion or inclusion of target words in their study. They claim that if 30 % of the participants give correct response to a target word, this word needs to be excluded from test scoring. That is to say, for the inclusion of a target word in the scoring, that word should be unknown for the 70% of the participants. Dwelling on this criterion, the present study would not include a target word in the scoring, if 36 participants out of 119 participants had given a correct answer to that target word. However, it should be noted that according to the scores from vocabulary checklist test, the number of participants responding correctly to the target words was much less than 36 for each target word (see Appendix T for Vocabulary Checklist results)

Consequently, this research assumed that cultural and linguistic background of the participants was similar as Chen and Yen (2013) and Ramezanali (2017) did. The study depended on voluntary participation. The participants were informed about the nature of the study. They were informed that their responses, scores and identities would be kept confidential, and their performances in the study would not affect their college grades. A total of 69 sophomores and 50 junior students participated voluntarily in the experimental phase of study. They were randomly assigned to three experimental groups and one control group, and each experimental group consisted of 30 students while the control group had 29 participants. The groups were labeled as A, B, C, and D according to the treatments given to the groups (see Table 6). The experimental group receiving textual, pictorial and auditory glosses was labeled as Group A. The one having textual and pictorial glosses was labeled as Group B

while the label Group C was given to the experimental group treated with textual gloss only. Group D was the control group in the present research.

Table 6. *Experimental Groups*

Groups	**Gloss types**
Group A	textual+ pictorial+ audio
Group B	textual+ pictorial
Group C	textual
Group D	no gloss (control)

As for qualitative phase, 12 participants from the experimental study volunteered for the interview. Thus, three participants from each experimental and control group took part in the second phase of the study.

Materials

This section describes the three main materials used in this research: reading texts, target words and the website. It further discusses how these materials were selected, prepared and designed, and justify why these materials were used.

Reading texts.

Three reading texts with different genres and topics for the same proficiency level were used in the present study. The types of these reading texts were a biography, a textbook article and a short story. The biography and textbook article were in the form of expository text while the short story was narrative by nature. In some of the related studies the researchers created their own reading texts (Al Ghafli, 2011; Ben Salem. 2006) and this can affect the reliability of the study because material development requires expert knowledge and experience. Thus, unlike those studies, this study made use of more reliable and authentic texts prepared by experts without adaptation or simplification as used in some other studies (Akbulut, 2007; Ertürk, 2016; Yanguas, 2009). The texts were used as in the form of their original versions taken from their sources.

For the selection of reading texts, the researcher searched for reading materials in the internet and textbooks published by Oxford and Cambridge University Press or in TOEFL books, which would be appropriate for the purpose of the current dissertation. After the first search of proper reading texts, over thirty reading materials were selected for each text type by the researcher. Then the researcher read each material carefully and decided on whether the vocabulary in the materials could be represented with pictures. After the second

evaluation of reading materials, the researcher selected four possible reading passages for each text type. Meanwhile, the reading texts were further evaluated by three experienced English language teachers working in Turkish state schools and two university instructors teaching English as a foreign language. The teachers and instructors were asked to examine twelve reading texts and decide on one text for each type regarding their suitability to the proficiency level of participants, their readability and the purpose of the study. After the third evaluation done by the experts, three texts that were found to be proper for the study were selected to be used as the reading material in the present research.

Among these three texts, two of them (a biography, a textbook article) were expository English reading texts, and the other one (a short story) was a narrative English reading text. The biography text was 'Martin Luther King' (taken from ielts-mentor.com), the short story was 'Cat in the Rain' written by Earnest Hemingway (xpressenglish.com) and the textbook article was 'Zulu Beadwork' (Lougheed, 2006), (see Appendices A, B and C for reading texts respectively). The texts were used without any adaptation, modification or simplification. Hence, they were authentic (original). The texts were 700-1100 words in length and each text included ten target words to be glossed. According to Nation (2013), at least 95% to 98% of the words in a text need to be familiar to ESL learners so that they can understand the text. Nation's text coverage was adopted in this study, and thus the texts were not too difficult to understand for the participants considering the number of target words in the chosen texts.

Four versions of each text were prepared to be used in the research for each group. The versions included:

i. the basic version of the text without any gloss
ii. the version with English definitions of the target words
iii. the version with English definitions of the target words with images
iv. the version with English definitions and images of the target words in addition to audio glossing.

Target words.

A pilot study was carried out to determine the target words for the main study. In the pilot study pen and paper versions of three reading texts were administered to twenty students with similar proficiency level in the same department. The students were asked to read each text and underline every word that they did not know. There was no time limit for this task. The students underlined every word that was unfamiliar to them. Then, the researcher entered the data gathered from the pilot study into Microsoft Excel and determined the frequencies of

unknown words (see Appendix O). In total, the students underlined thirty-five words in the biography text and the short story whereas they underlined forty words in the textbook article in total. Since there were some words underlined only by a small number of the students, the most unknown words were chosen by the researcher. The previous research in literature has also showed differences in terms of the number of glossed words versus text length (Akbulut, 2007; Al Ghafli, 2011; Al-Seghayer, 2001; Ben Salem, 2001; Chun & Plass, 1996a, b; Ko, 2012; Ramezanali, 2017; Türk & Erçetin, 2014; Yoshii, 2006). The word coverage differs from one study to another. For instance, while Ben Salem (2001) glossed 25 target words in a 602 word-text, Türk and Erçetin (2014) used 980 word-text with 35 glossed words, and Al-Seghayer (2001) glossed 25 target words in a 1300 word-text. There is no general agreement on the percentage of words to be glossed in a text. However, glossing many words in a text was found to be distractive and have negative effects since the learners concentrated on glosses more than it was necessary and missed contextual clues (Choi, 2016). For the frequency of unknown words, Nation (2013) suggested to 'gloss mid-frequency words and replace low-frequency words' (p. 14) because low frequency of words includes only 1% of word-coverage. Following Nation (2013) and Ko (2012)'s suggestions, the current research took into account the frequencies of unknown words. The words underlined by 50- 60% or more of the students in the pilot study were selected as target words for glossing. In conclusion, ten mostly underlined words for each text, a total of 30 words out of 110 underlined words were selected and glossed in this study (see Appendix M1 for the target words). The number of glossed words in each text was not too many to distract learners from reading while learning new words. All of the selected target words appeared once in each text. As the research indicated that words encountered more in a reading material are more likely to be learned compared to words encountered once, all target words in this study were equally encountered during the experiment.

The selected target words were prepared according to the three types of glosses used in the experimental conditions:

i. For textual glossing; Turkish translations, English definitions, forms of the target words and an example sentence were represented for each word. In this regard, Turkish translations of the target words were taken from Cambridge Learner's English- Turkish Dictionary online. English definitions of the words with example sentences and forms of the words (i.e. noun, verb, adjective), on the other hand, were obtained from Oxford Advanced Learner's Dictionary, Cambridge Advanced Learners' Dictionary and Longman Dictionary online. These dictionaries provided

clear and simple definitions of the target words. The justification for using L1 translations in addition to L2 definitions is based on the findings of the previous studies that investigate the effects of L1 versus L2 glosses as it has been mentioned in the second chapter under L1 and L2 glosses subsection. The research indicated that L1 glosses were preferred and found to be helpful by the participants over L2 glosses (Davis & Lyman-Hager, 1997; Ko, 1995; Lomicka, 1998). Therefore, both L1 and L2 glosses were included in the textual gloss. The information in the textual gloss was reviewed and evaluated by two native speakers of English and an English language teacher in terms of the suitability to the meaning in the texts, and clarity for the participants' proficiency level. Since L1 translations of the target words were also provided in the textual gloss, further examination of English definitions in terms of understandability was not necessary. Even if the participants had not fully understood the L2 definitions, they would have consulted for L1 translations for getting the meaning of the target words for sure (see Appendix M2 for textual glosses).

ii. As for pictorial glossing, relevant pictures for unfamiliar words were searched on the Internet. Three pictures per each target word were chosen as representatives of the words by the researcher. Then, these pictures were rated by three English language teachers. The teachers were requested to choose the most appropriate picture illustrating each target word. Based on the evaluation of the teachers, the pictures that were found to be the most compatible for each target word were used in the pictorial gloss condition, which conforms to the ways in which pictures were chosen in the previous studies (Akbulut, 2007; Al Ghafli, 2011). The picture resolution and size were also considered in the selection of the images. In conclusion, thirty pictures best depicting the meaning of thirty target words were utilized in the pictorial gloss condition (see Appendix M3 for pictures).

iii. Concerning the audio glosses, the researcher decided to give English pronunciations of the target words as well as audio-recordings of their definitions. In most of the gloss studies that provides auditory information, merely the pronunciations of target words were included. However, that kind of gloss may not be sufficient for learners hence, more auditory information had better be provided in audio glosses. That is why, the current study presented English definitions of the target words in auditory form, as well. For audio-recordings, since the researcher is not a native speaker of English, two native speakers of English, who were PhD students of linguistics in the United States of America, were asked to read and record the L2 definitions of the target words clearly and precisely. In the same way, one English

language teacher recorded his pronunciation. Thus, three recordings were prepared by three different individuals. Later, the recordings were evaluated by three English language teachers, and following the teachers' ratings the best recordings for each word were determined and used in the audio glossing. The quality of the audio recordings and clearness of the voices were also taken into consideration in the preparation process of audio glossing. In the end, thirty audio recordings including both the pronunciation of the words and their English definitions were manipulated in the audio gloss condition.

The website.

Having prepared all the materials, the researcher started to design the host website as the present study was carried out in a multimedia environment. The researcher designed the final forms of the texts with three different gloss types in an electronic format with the help and support of an expert on computer engineering. WordPress was used in the creation of the website. WordPress is an open-source software created by Mark Mullenweg and Mike Little in 2003 that enables forming web pages. In order to create a website, first a hosting or domain is needed to be obtained from WordPress software and then over that domain, the website can be created easily without a great deal of coding knowledge. WordPress is now the mostly used content management system in the world. Using WordPress, three hypermedia texts (biography, textbook article, short story) were created, and over these texts four parallel versions of each hypermedia text were developed. The host website was designed according to web design principles by Nielsen (2000), and models and applications proposed by Muter (1996).

Four versions of parallel texts were prepared to be used for each experimental condition were:

i. the basic text form without glossing accessed by control group
ii. the text form including textual glosses accessed by one of the experimental group
iii. the text form including textual glosses and pictures accessed by one of the experimental group
iv. the text form including textual glossing, pictorial glossing and audio glossing accessed by one of the experimental group.

To access these versions of electronic texts, the participants were assigned to groups, each of which got a different version of the text as shown in the Figure 5. The purpose of

creating groups was that each group needed to get exposure to another version of the text in order to test the effectiveness of different glosses. After the participants clicked on their group number, they were asked to enter a username and password to get access to the electronic texts (Figure 6). Logging in the website was necessary in order to save each participant's data into their log file.

Figure 5. A screenshot of the groups from the website.

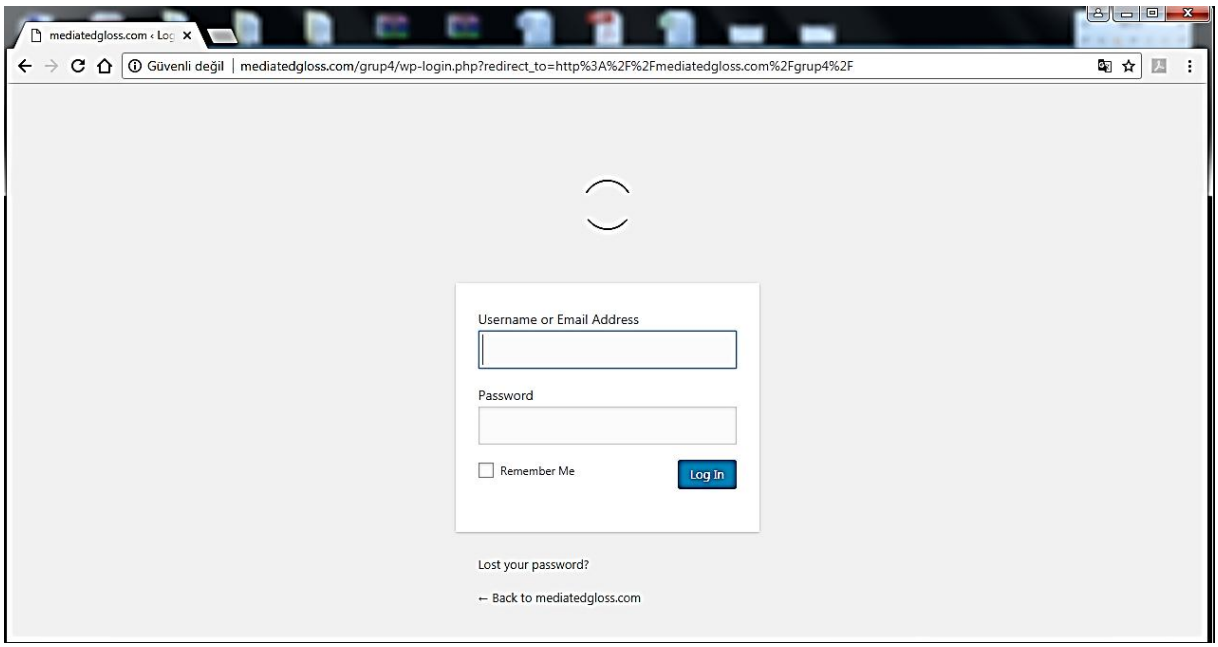

Figure 6. A screenshot of the log-in page from the website.

In the electronic texts, all the target words were highlighted. For the control group, these target words were bolded in order to take attention of the participants over the target words. For three experimental groups the target words were hyperlinked (Figure 7). When the

participants clicked on any target word, a pop-up window appeared and showed gloss information appropriate to their experimental conditions.

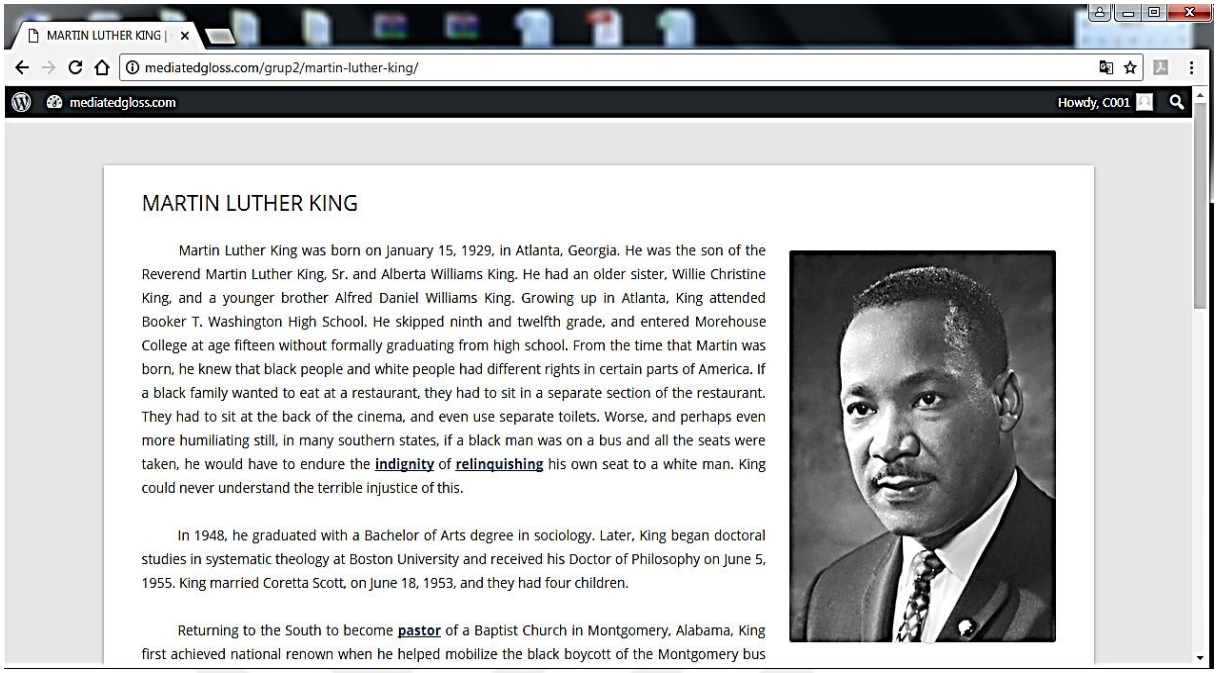

Figure 7. A screenshot of a text with target words hyperlinked from the website.

When the participants in textual gloss condition (group C) clicked on each target word, the pop-up window as in the Figure 8 opened, and the participants thus got access into textual gloss including L1 translation, L2 definition, the abbreviation of the grammatical form and an example sentence of the clicked word. After examining the gloss, the participants could exit easily and return to the reading text with just one click. In order not to intervene reading process, the pop-up window did not cover the whole page. The participants could see reading material blurred on the background (Figure 8).

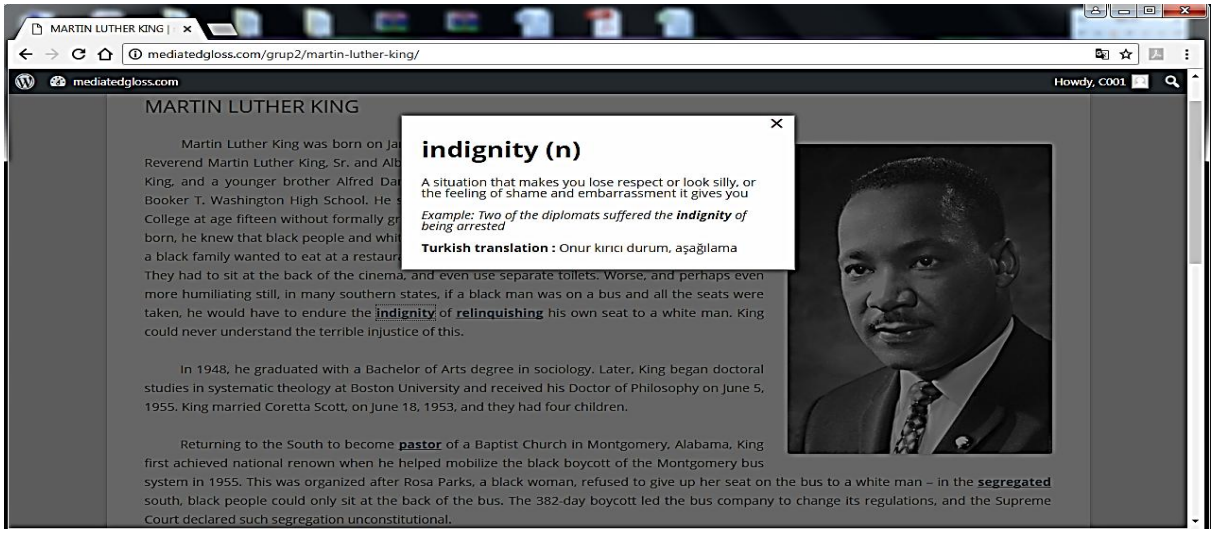

Figure 8. A screenshot of pop-up window from the website.

Similarly, when the participants in the textual and pictorial gloss condition (group B) clicked on a target word, a pop-up window appeared in the middle of the page indicating both textual gloss as it was explained in the textual gloss condition and a picture simultaneously not successively. As it can be seen from Figure 9, the textual gloss was followed by the picture representing the target word. As for the participants in the textual+ pictorial+ audio gloss condition (group A), the gloss as in the example Figure 10 was displayed with one click on the target word. There was a toolbar in front of the definition of the target word with a play button. The participants needed to click with a mouse on the play image in order to get audio gloss. They could replay the recording as much as they wanted.

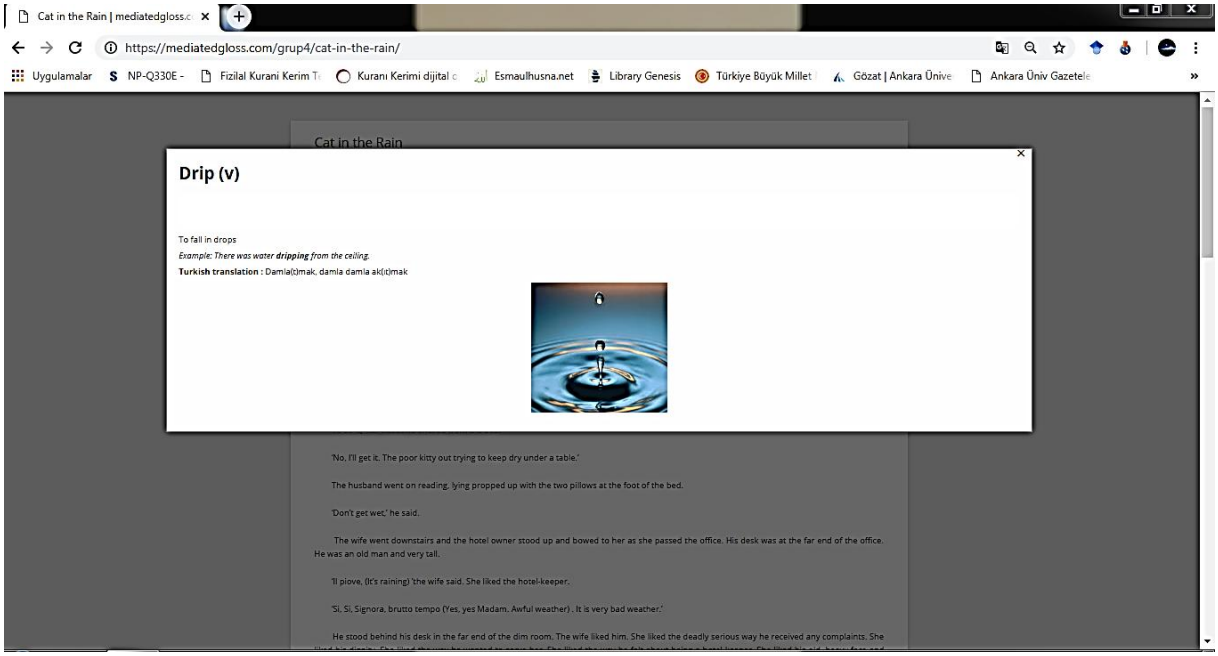

*Figure 9.*A screenshot of textual and pictorial glossing from the website.

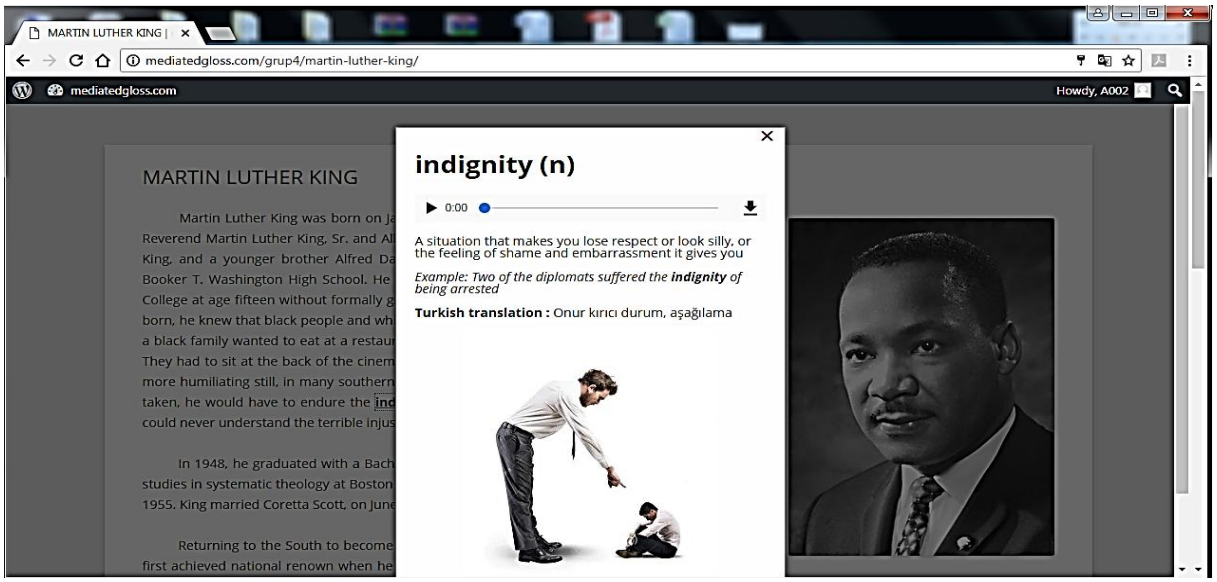

*Figure 10.*A screenshot of textual, pictorial and audio glossing from the website.

In addition to three reading texts with twelve parallel forms and three gloss types, the reading comprehension tests and vocabulary test were also included in the website. When the participants finished reading a text, an electronic reading comprehension test in the form of multiple-choice and true-false was displayed (Figure 11), and the participants could answer the test by clicking on the available options. The website recorded every answer in the background. All of the tests used in the present study were electronically created and answered online on the website. When the participants finished the test and exited, their responses to the questions were saved in a log file for each student.

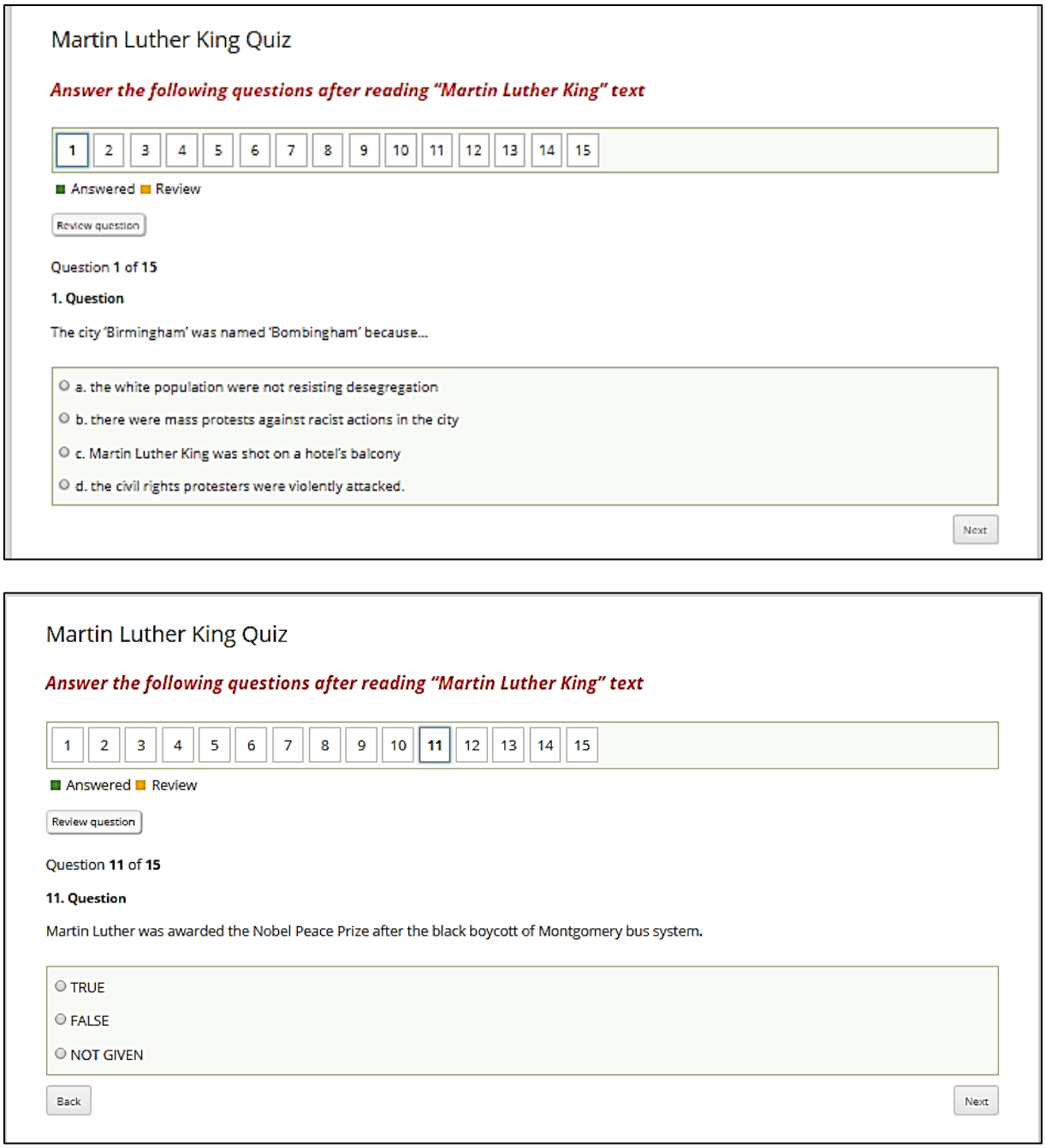

Figure 11. Screenshots of reading comprehension questions (multiple-choice and true-false) from the website.

The general outlook of the website, the practicality of navigation, background color, font size and font type were considered carefully at the stage of designing the website. Two instructional designers were consulted for their comments and evaluations about the website. Considering their comments and feedbacks, necessary modifications were made before the website was piloted. Each reading text was presented in one webpage. The participants needed to scroll down in order to continue reading the texts. At the end of the reading texts, there was a 'start quiz' button (Figure 12). When the participants clicked on that button, they were directed to the reading comprehension test. After they passed the reading text, there was no turn to the texts. On each page there was one question. At the beginning of the test page, the participants encountered with a navigation bar for questions (see Figure 13). The participants could navigate back and forth through the questions easily. The answered questions became green in the navigation box (Figure 14). Therefore, the participants could understand which questions they gave response to and which questions remained unanswered. At the end of each question there was also 'next' button (Figure 11) that directed the participants to the next question. When they completed the test, the website asked them to save. That process was the same for each reading text and reading comprehension test. At the end of reading texts and tests, the participants were forwarded to a vocabulary test which was in multiple-choice format. At the end of the last question, there was a finish button. When the participants clicked on the finish button all of their responses were saved (Figure 15), and finally they were asked to log out (Figure 16).

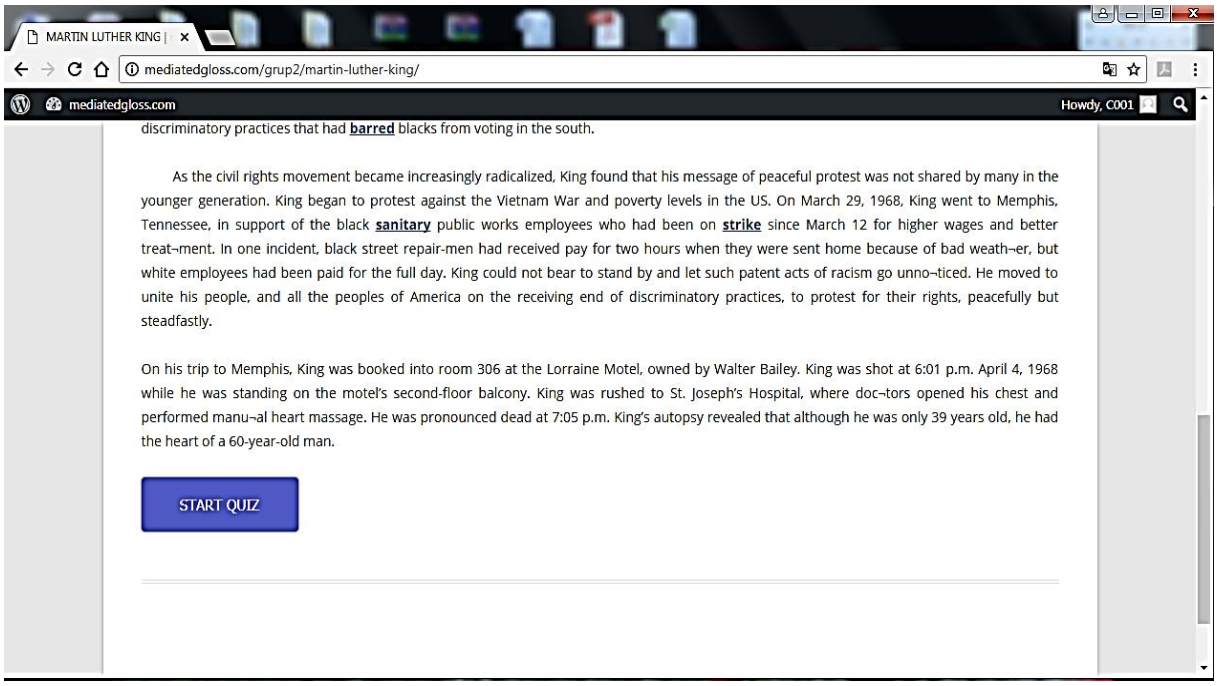

Figure 12. A screenshot of start quiz button from the website.

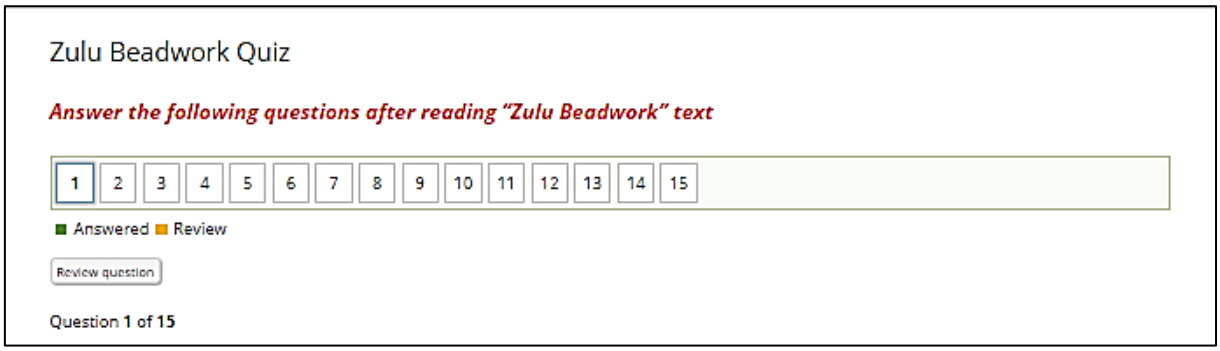

Figure 13. A screenshot of navigation tool for questions from the website.

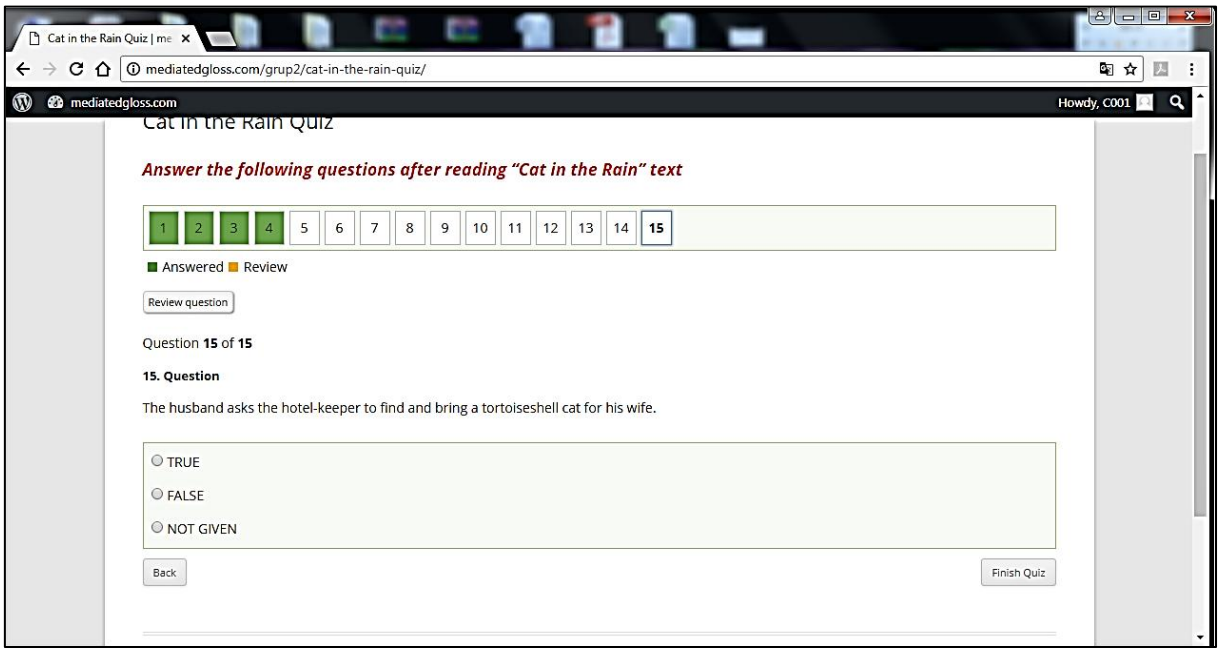

*Figure 14.*A screenshot of answered questions (green in the navigation tool) from the website.

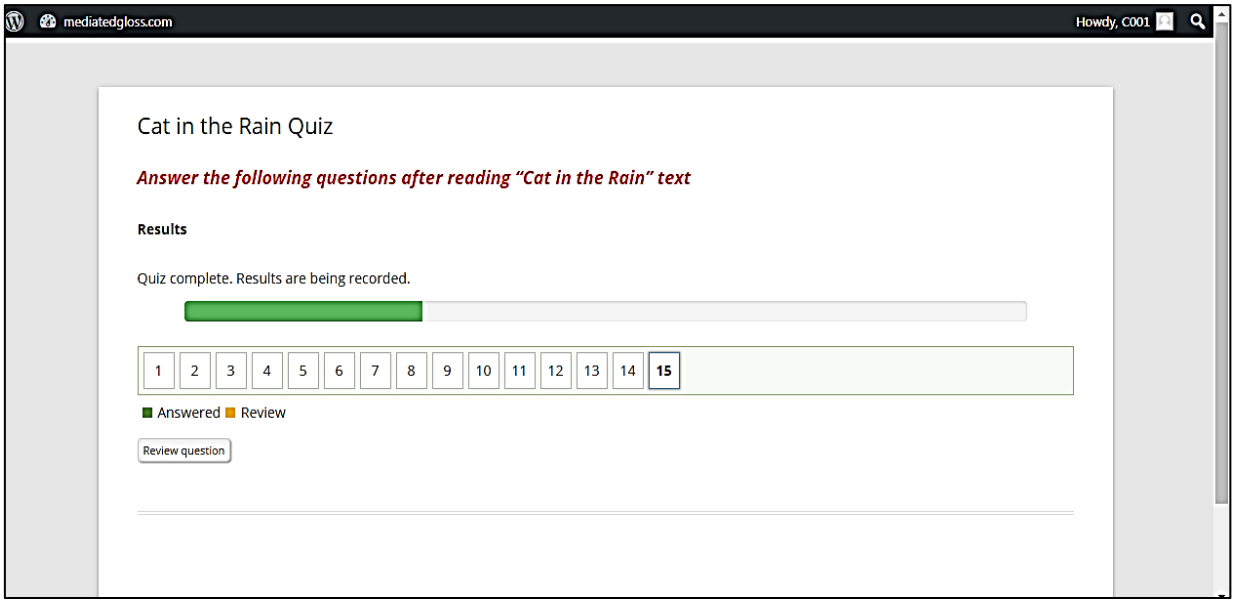

Figure 15. A screenshot of the results being saved from the website.

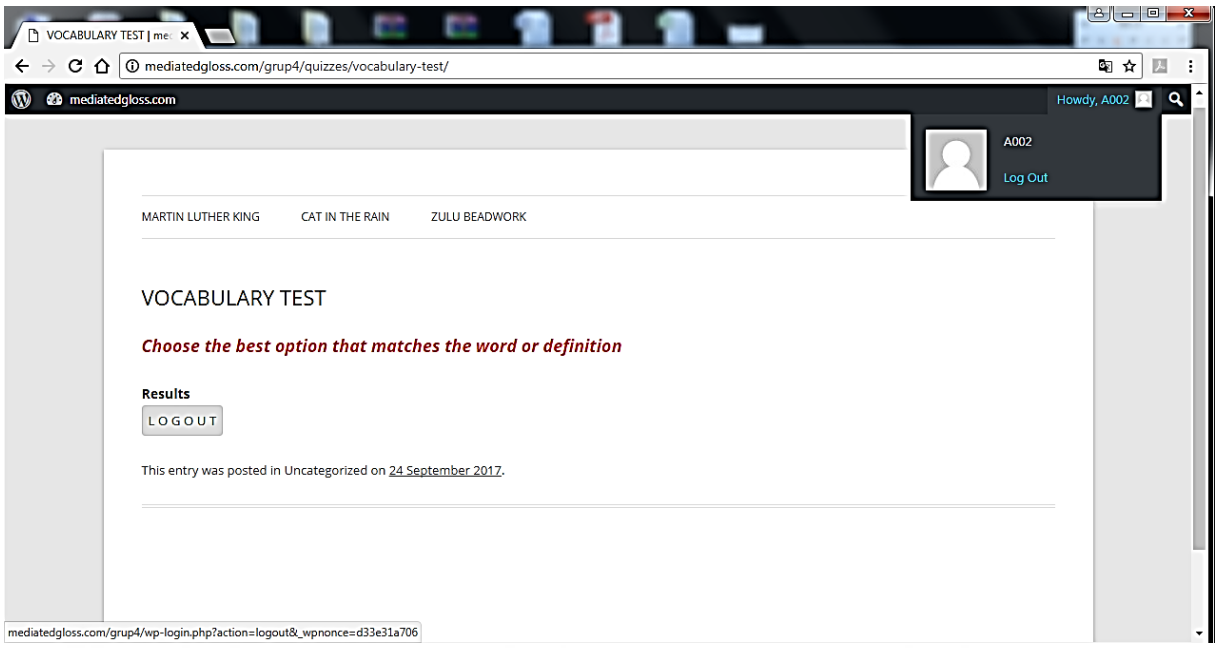

Figure 16. A screenshot of logging out from the website.

After necessary adjustments were made in line with expert opinions, the study was piloted with twelve students who did not participate into the actual study from the same department. Their ages ranged from 19 to 21 years old. Each student had a computer and internet access during the pilot study. They were assigned to four groups as it was planned in the actual study. The researcher gave directions of the study and explained all the steps they needed to follow throughout the pilot study. Three students in each group were provided with a username and a password to log in the website. Three students receiving audio gloss treatment were given headphones. After logging in the website, the students read the texts according to the treatment given to their group and then answered the tests. While they were reading the texts, the researcher observed them and provided assistance if needed. At the same time the researcher recorded the time the students spent on each text and test. When the pilot study was finished, the researcher asked the students to write their opinions about the study, website, texts and tests (see Appendix S for examples). After they wrote their opinions, the researcher also negotiated with them for their suggestions and opinions. The researcher mainly focused on how the students used the website, how they responded to data collection instruments and how data collection process was carried out in the pilot study. Since the pilot study was conducted with a small group for the testing of the website, the results of the students' scores in the pilot study were not elaborated on.

Most of the students gave positive feedbacks to the study. The ones in the control group reported negative attitudes and opinions because they found the texts complicated, which was understandable and expected as they did not get access to any gloss during the study. The students having pictorial glosses found the pictures helpful for remembering the

target words. The students also thought that compared to the English definitions of the target words, their Turkish equivalents were more useful for understanding the content of the texts and learning the vocabulary. The three students having audio glosses noted that learning the pronunciation of the words while reading a text was a beneficial and interesting experience. The students' suggestions about the navigation of the website and the study were also evaluated. Considering their comments, a few small adjustments were made in the navigation of the website. Two students stated that they wanted to turn back to the reading text while they were answering the reading comprehension questions because they could not remember what they had read. That is why, the researcher decided to allow the participants to take notes while reading the texts and use their notes while answering the reading comprehension questions. The researcher also determined how much time to give for the participants in the main study. Besides, the researcher decided to change the order of vocabulary tests based on her observations during the pilot study. In order to prevent the students from focusing on the target words in the reading texts exaggeratedly during reading process, the researcher combined the three vocabulary tests into one test and gave that vocabulary test at the end of the study instead of presenting each one of them immediately after reading the relevant text,. After piloting the study, the researcher completed the design of the website and was ready to conduct the main study. The instruments used for data collection in the current research are discussed one by one in the next section.

Data Collection Instruments

The aim of this study is to shed lights on the impact of multimedia glosses on L2 learners' reading comprehension and vocabulary learning. To realize the purpose of the study, it was necessary to get information about EFL learners' performances in the achievement tests, their attitudes towards reading online with glosses as well as their experiences, opinions and perceptions about the treatment. In this regard, data collection was completed in two phases. For the quantitative phase of the study, the data was collected with a tracking tool, a background questionnaire, reading comprehension and vocabulary tests developed by the researcher, an Attitude Questionnaire towards Online Glosses (Al Ghafli, 2011) and a feedback questionnaire developed by the researcher. For the qualitative phase of the study, semi-structured interviews were conducted with some of the participants from quantitative phase to get an in-depth understanding of their perceptions about their experiences with mediated glosses, reading texts and the experiment in general. To that end, these data collection instruments are explained comprehensively in the following sub-sections.

Tracking tool.

A tracking tool is a useful technology that provides researchers the opportunity of following learners' actions during a certain hypermedia learning task. Via this tool learners' interaction with a hypertext can be tracked, and most importantly researchers may get valuable information about learners' reading strategies (Blake, 1992) and may explore learners' behaviors with a process-oriented approach (Hulstijn, 1993). Both the process and product of learning may be investigated by means of such technology (Collentine, 2000). Therefore, in this study a tracking tool was built into the website to be able to track the participants' behaviors during reading task.

The tool tracked every action of the participants with the text. It saved information about whether they clicked the glossed words or how many times they clicked on the glossed words. The information was recorded in a log file for each participant. Lomicka (1998) and Ben Salem (2006) used the features of the very same program in their studies thanks to its reliability and validity. This program allowed the researcher to determine if there was a relationship between access to glosses and word retention, which is one of the research questions of the study.

Background questionnaire.

The researcher developed a background questionnaire to gather additional and demographical information about the participants (see Appendix I) based on the literature. In the background questionnaire, there were questions about the participants' age, gender, nationality, grade level, computer skills and their cumulative grade point average. Furthermore there were several questions assessing their English proficiency such as their self-assessment of English proficiency levels, how long they have studied English, how much time they spend on studying English outside, L1 and L2 reading abilities, L2 learning anxiety and their use of dictionary. This questionnaire was administered to the participants before the treatment. Thanks to the questionnaire, the researcher had the opportunity to have very useful information about the participants such as their biography and proficiency levels of English beforehand. Thus, the researcher could use this information while interpreting research findings.

Vocabulary knowledge checklist.

Vocabulary Knowledge Checklist was developed by the researcher in order to understand whether the participants had already known the target words that were used in the study. It was in the form of a checklist (see Appendix D). The checklist included 49 English

words all of which were taken from the selected reading texts. 30 of these words were the target words while the remaining 19 words were added into the checklist as distractors. The participants were asked to put a tick for each word that they had already known and write their meanings in their L1 or in L2. This checklist was administered to the participants before the experiment. Answering this checklist took approximately 8-10 minutes. This checklist let the researcher make sure about whether the participants were familiar with the target words, and how many students recognized the target words.

Reading comprehension tests.

There were three reading texts (a biography, a textbook article, a short story) used in the experiment. In order to examine the effects of mediated glosses on reading comprehension of the participants, the researcher decided to develop reading comprehension tests that could measure the participants' understanding of each reading material while they were exposed to glosses. Given that the investigating the effect of different types of text with mediated glosses on L2 learners' reading comprehension was also one of the purposes of the present study, the researcher had selected three different reading materials. Based upon each selected text, the researcher formed three reading comprehension tests (see Appendices E, F and G).

Reading comprehension tests included multiple-choice questions as well as true/false questions to get more valid measure of receptive skills in L2. Both types of questions were non-written assessment tools. The justification of using non-productive tests came from Hughes (2003) suggesting that the assessment of receptive skills in another language through non-written tests like multiple-choice represents more reliable and valid results since this type of tests eliminates the possibility of interference into scoring caused by students' low level of writing ability. In other words, these comprehension tests were prepared to assess the participants' receptive skills in reading comprehension. A production test would not be appropriate for this study because the participants of this study were non-native speakers of the target language and likewise, their ability to write or produce could hinder the true assessment of comprehension (Lee, 1986).

Additionally, the test was formed for the purpose of measuring both general and local reading comprehension. It was argued that careful reading for global and local comprehension "excludes reading types such as skimming quickly to get the gist, search reading to locate and comprehend quickly the material relevant to predetermined needs of the readers and scanning to locate specific information (i.e., symbols, words, dates)" (Akbulut, 2007, p. 52). Therefore, in order to get the participants involved in reading process not for just specific information, or for quick skimming, these reading tests were prepared to require both global and local

comprehension. For global and local reading, the participants were expected to comprehend, form connection, interpret and infer in the process of reading (Akbulut, 2007).

The reading comprehension tests consisted of 9 multiple-choice and 6 true/false questions. Since two of reading texts (Zulu Beadwork, Cat in the Rain) were taken from the sources with educational purposes, there were some multiple-choice questions related to the texts in those sources. The researcher reviewed these questions and adapted a few of them in the relevant reading comprehension tests before the tests were piloted to ensure reliability. The researcher developed other multiple choice and true-false questions in all of the three reading comprehension tests on her own. The researcher already had the necessary knowledge to prepare multiple-choice questions because she took a course on assessment and evaluation used in education during her B.A. study, thus she learned the principles of constructing multiple-choice tests. For multiple choice questions, there were four alternatives. In the true/false questions there was another alternative than either *true* or *false,* which was *'not given'* for each statement. In this way, the participants' chance of guessing the correct answer was reduced.

After preparing 9 multiple choice questions with 4 distractors and 6 true/ false questions for each relevant reading text, the researcher asked three colleagues to check the tests in terms of grammar and language use. Getting their suggestions about the language of tests and making small adjustments, the researcher constructed the final version of the tests. Then the researcher needed to get expert opinions for achieving validity in the tests. To this end, the researcher gave the copies of each reading comprehension test and reading text to 6 experts and asked them to examine the content of the text along with test items. The experts were two assistant professors in an ELT department, two research assistants having their PhD in an ELT program and two experienced English language instructors lecturing at a state university in Turkey. The researcher requested that the experts gave their comments about the questions at the end of each question and wrote *A* if the question was appropriate for the purpose of the study and the text, *I* if it was inappropriate, and *NC* if they thought that the question needed to be corrected. They were also asked to comment on anything to be edited or changed. After getting their feedbacks, the researcher went through each question considering the experts' comments. No multiple choice-questions in the reading comprehension tests were found inappropriate. Therefore, the researcher did not take any multiple-choice question out of the tests, but she improved the true/false questions according to the experts' suggestions. In this way, the researcher gave the final touches to the reading comprehension tests by ensuring the content validity through expert opinions.

In order to check their reliability, the questions in the reading comprehension tests were piloted on forty-seven prep students with similar proficiency levels from the ELT department of the same university. The students were asked to read each text and then answer related questions in a paper and pencil format. The students were provided with a glossary as a separate list for the target words which were bolded in the reading tests (Appendix M2). The reading comprehension tests had a coefficient alpha of .73, .71 and .695 (KR-20) respectively. Through pilot testing, the researcher could also determine how much time was needed for completing the reading texts and reading comprehension tests. Therefore, the researcher could make a time plan for the main study.

Each reading comprehension test was answered directly after the participants read the related reading text in the experiment. After the participants finished reading the text online, they were given a 15-item reading comprehension test associated with the text on the computer. The participants completed all of the tests online. Each comprehension test consisted of nine multiple-choice and six true-false questions. The participants could not have access to go back and check the reading text during the test; however, they could take notes while reading the text and were allowed to make use of their notes during the tests. When the participants finished the test and exited, their responses to the questions were saved in a log file for each student. Each correct answer was awarded 1 point whereas incorrect answer was awarded 0 point. The highest possible score for each test was 15 and that is to say, 45 for all of the three reading comprehension tests.

Immediate vocabulary tests.

In the present research, immediate vocabulary tests were prepared to measure the impact of the three different combinations of electronic glosses used in three different texts on EFL learners' incidental vocabulary learning. The vocabulary tests were in the form of multiple-choice, which was a non-productive assessment test form because the participants' receptive word knowledge was in the scope of this study rather than their productive word knowledge. For language learners, receptive word knowledge requires the ability to recognize a word and remember the meaning of the word whereas productive word knowledge demands using that word in speaking and writing (Nation, 1990). Since in this study the learners were exposed to the meanings of target words while reading in merely the treatment session, and they did not have enough knowledge about how to use the target words in speech and writing, it would not be proper to assess the learners' vocabulary gain with productive tests. Likewise, as this study aimed to assess the L2 learners' incidental vocabulary knowledge, explicit instruction on the target words was avoided, and the learners were not aware that they were

given a vocabulary test in the study. Incidental vocabulary learning takes place while learners are engaged in another activity like reading in which the attention of learners is on message (Huckin & Coady, 1999). For that reason, the learners had limited exposure to the target vocabulary incidentally. In this regard, the vocabulary tests in this study were developed to assess the receptive word knowledge of language learners with multiple-choice questions that required the learners to recognize and recall the meanings of the target words.

In vocabulary recognition tests, according to Read (2000) test takers are given target words and asked to choose their meanings so that they can show if they understand those target words. Following Read's explanation, the researcher prepared 30 multiple-choice questions in the form of recognition test for the assessment of the target word learning. In other words, the vocabulary tests consisted of 10 recognition items for the target words in each text (see Appendix H). There were two kinds of questions in the tests. In some of the questions, the target word was given in the stem and the test takers were asked to choose the appropriate definition of that target word from four alternatives as illustrated in the example question below:

"*Example:* 1. '**Dub'** means….

a. to lose respect and look silly in a situation
b. to make a formal speech to a large group of people
c. to give someone or something a particular name or description
d. to separate one group of people from others"

In some of the questions; on the other hand, the definition of the target word was given in the stem and the participants were asked to match the definition with the appropriate word among the available four alternatives.

Example: **1**. 'To happen or exist as the final result of a process or situation'

a. restrict **b.** register **c.** culminate **d.** pronounce

All the questions were based on recognizing the target word or the definition. In order to avoid the test to be a memory exercise, the definitions of the target words given in the stem or in the alternatives were not the same as the ones in the glosses. The definitions of the target words that were different from the glosses in terms of wording were taken from different dictionaries such as Online Dictionary by Merriam Webster, Collins English Dictionary online, Oxford Advanced Learner's Dictionary, Cambridge Advanced Learners' Dictionary and Longman Dictionary online. Moreover, the words from the texts and other target words were used as alternatives for the questions which asked choosing the correct word for the definition. As for the definitions given in the alternatives, some definitions of the target words

were used to avoid just memorization but to measure target vocabulary learning. Al-Seghayer (2001), Ben Salem (2006) and Al Ghafli (2011) used a similar test formatting in their studies.

After preparing the vocabulary tests, the researcher asked two English language instructors to check the questions in terms of wording, grammar and technical problems. In line with the instructors' reviews and feedbacks, the researcher made small changes in the language used in the questions. Then the researcher asked for expert opinions to ensure the validity of the data collection instrument. As in the validity process of reading comprehension tests, the same experts gave their comments and evaluation on vocabulary tests. Since both reading comprehension tests and vocabulary tests were prepared based on the same reading materials, both vocabulary and reading comprehension tests were handed out to the experts at the same time, and they were asked to examine all of the tests in line with the objectives and content of the study. For the vocabulary tests, the experts gave positive comments to the researcher in general, but only one of the experts suggested that two of the alternatives could be changed. Considering that suggestion, the researcher consulted the expert about his suggestion, and made necessary adjustment. Thus, the vocabulary tests were finalized for the piloting in order to check their reliability.

The vocabulary tests were piloted along with the reading comprehension tests. After the students in the pilot study answered the reading comprehension questions, they were administered the vocabulary tests. The analysis of vocabulary tests indicated that the tests had reliability coefficients of .72, .76 and .73 (KR-20) respectively. The participants in the main study were given these tests after they finished reading the texts and answered the reading comprehension tests. They took this unannounced test online at the end of the experiment. Their scores were recorded in their log files. Each correct answer received 1 point while each wrong answer received 0 point. The full score was 30.

Delayed vocabulary test.

The delayed vocabulary test consisted of the same questions in the immediate vocabulary test, but the order of the questions was different (Appendix L). This test was handed out to the participants two weeks after the treatment. The purpose of administering this test two weeks later was to determine if the participants could recall the target words. The participants' earlier scores on immediate vocabulary test were compared with the ones in the delayed test to assess the participants' word retention. A similar time interval between immediate vocabulary test and delayed vocabulary test was also adopted by several researchers (e.g. Al Ghafli, 2011; Ben Salem, 2006; Jones, 2004; Ramezanali, 2017).

Attitude questionnaire towards online glosses.

The researcher used the "Attitude Questionnaire towards Online Glosses" developed by Al Ghafli (2011) which was manipulated for understanding the language learners' attitudes towards reading the electronic texts and using the glosses. There were 9 statements eight of which used a 5-point Likert scale while one statement was a question enquiring how often the participants utilize online glosses (see Appendix J). The questionnaire had coefficient alpha of .77 for internal consistency. The questionnaire was administered to the participants after they completed the immediate vocabulary test. For the analysis, one item (number 5) was reversely coded as it was the only item worded with a verb with negative meaning. The questionnaire was handed out to the participants in the experimental groups except control group because the control group had no access to the glosses.

Feedback questionnaire.

The feedback questionnaire was prepared by the researcher to find out more information about the participants' opinions about the texts used, the tests, the website and the mediated glosses (see Appendix K). The questionnaire focused on their experiences with the treatment in detail that could be helpful in interpreting and shedding light on the research findings. There were 16 questions in the questionnaire with 2 open ended questions. Most of the questions were close-ended and centered on the reading materials as this study used three reading texts rather than just one. There were questions to learn more about how difficult they found each texts in terms of vocabulary, grammar, language use and content; whether they found each of the reading texts interesting; which reading text they liked the most; what kind of text types they read and like most; and whether they found each reading text appropriate to their proficiency level. There were also other questions about how they rated the website as well as navigation, and how useful they found each gloss content in terms of understanding the texts and learning vocabulary. The questionnaire was checked by two experts in ELT department at a state university in terms of the language and content. A similar version of the questionnaire was also used by Akbulut (2007). This questionnaire was administered to all of the participants along with the attitude questionnaire after the intervention. Both of the questionnaires provided useful information about the participants' experiences and attitudes towards three combinations of mediated glosses (textual, textual+ pictorial and textual+ pictorial+ audio glosses) for this research.

Semi-structured interviews.

Interviews are the most commonly used data gathering instruments especially in social sciences (Marshall & Rossman, 1999; Punch, 2011). Interviews assist the researcher to obtain information about the interviewees' opinions, thoughts, attitudes, perceptions, experiences and reactions which cannot be gathered through observation (Patton, 2002). In order to collect in-depth information about the participants' perceptions, attitudes, experiences, thoughts and opinions about reading in hypermedia environment, the three texts they read, the multimedia glosses and the website, the researcher conducted semi-structured interviews for the qualitative phase of the study. Semi-structured interviews are neither structured strictly, such that all of the questions are closed-ended; nor, totally unstructured such that the entire interview is in the form of conversation. Semi-structured interviews consist of questions that can elicit interviewees' opinions and thoughts. Besides they allow researchers to add questions during interview according to the interviewee' responses and ask for clarification.

The researcher prepared some guiding questions for the interview (see Appendix N). These questions were reviewed by two experts in terms of the appropriateness for the purpose and comprehensibility. Regarding the suggestions given by the experts, the researcher edited some of the questions. After finalizing the interview questions in the light of expert opinion, the researcher piloted the interview with one of the volunteer participants in the experiment to improve guiding interview questions. In the result of piloting, the researcher could be sure about what to ask and how to make interviews.

The semi-structured interviews were carried out with 12 volunteering participants (three participants from each group) by the researcher. Interviews were conducted either face-to face or on the phone. The participants were asked whether they preferred face-face interview or phone interview. According to their preferences, 5 of the participants were interviewed face-face while the remaining was interviewed on the phone at different time intervals. Each interview lasted 15- 25 minutes. The interviews were completed within three weeks after they participated in the study.

Either face-to face or phone interview, all interviews were recorded with the consent of the interviewees and transcribed for data analysis by the researcher. The researcher read the transcription many times in order to understand each interview as a whole and then divided each transcription into meaningful units considering the interview guiding questions. The researcher tried to figure out what each unit meant conceptually and coded the data in the units. After coding all of the interview transcriptions, the researcher reviewed each code to find patterns to form a set of categories. By labeling and categorizing interview data, the

researcher determined themes representing the categories that could explain interview findings comprehensibly. The participants' statements including the important themes were extracted by the researcher and presented in the results section. Three months after the first content analysis, the researcher analyzed the qualitative data from the interview again with an expert help and checked if there were differences between the former and latter analysis for reliability purposes. Both content analyses were consistent with each other except several differences in coding. By means of coding again after three months, the reliability of content analysis was checked. In addition, to enhance the validity of the interviews, member checking was ensured through getting the approval of the data from the interviewees almost three months after the interview. The results of the interviews were presented in a narrative way with some quotations from the transcripts after the related findings from the feedback questionnaire to avoid repetition because the results of the questionnaire and interviews were similar and supported each other.

Data Collection Procedures

In the present study, the material development (texts, target words, the website) along with test preparation including the piloting prolonged 5 months (January 2017- May 2017), and the data were collected from the participants in 6 weeks during 2017-2018 academic year. Since this study investigated the effects of electronic glosses, the experiment needed to be conducted in a computer laboratory with the Internet access. There were two computer laboratories available in the Education Faculty of the university. However, the laboratories were not available for the researcher to conduct the study because these laboratories were already used actively by the university students for their regular classes. Therefore, the researcher searched for a new computer laboratory outside of the faculty. There were two other computer labs in the School of Foreign Languages at Ataturk University. The researcher got permission for using the labs; however, there was another big problem which was the malfunctioning of the computers in the labs. To solve this problem, two experts from information services were asked to repair the computers and internet access in the labs. The experts could repair all of the computers in one of the labs, yet nearly half of the computers in the second lab could not be repaired. Thus, there were 26 desktop computers functioning properly with internet access. Due to the number of the computers working properly in the lab, the number of the experiment sessions increased. The data collection in the labs took place in 5 sessions, and also the data collection in their classrooms took place in 4 sessions.

The study was carried out during the regular class periods. The participation in the study was voluntary. The researcher got the necessary permission from the faculty for

conducting the study (see Appendix R). The students were told that the participation would not have any effect on their performances in the class. A total of 119 participants from the department participated in the study. They were randomly assigned to four groups and treatments. The participants getting the treatment in the first sessions were requested not to share any information about the study with their peers in order to avoid data contamination. The data collection procedure was described in the following three stages in detail:

Before- treatment stage

1. The experimental study consisted of four groups: textual glossing, textual+ pictorial glossing, textual+ pictorial+ audio glossing, and no glossing group. In order to log in the website and receive the treatment according to their gloss condition, the participants needed a username and password. Therefore, the researcher had prepared a list of usernames and passwords beforehand to ensure that there was an equal number of participants in each group. The usernames (A001, A002, A003...; B001, B002, B003…; C001, C002, C003…; D001, D002, D003…) were used in order to understand under which condition the participants got the treatment. The usernames starting with the letter A corresponded to 'textual+ pictorial+ audio gloss condition', the ones with B referred to 'textual+ pictorial gloss condition', the ones beginning with C corresponded to 'textual only gloss condition' and D referred to 'no glossing condition'. Each username associated with the password was written on a piece of paper in order to be randomly distributed to the participants after they entered into the lab.

2. Upon getting in the lab, username papers were randomly handed out to the participants. Therefore, the participants could be assigned to the four gloss conditions randomly. Then the participants were informed about the purpose of the study, and they were told that their responses and identities would be kept confidential. After this brief introduction, the researcher administered the Vocabulary Knowledge Checklist to the participants and it took 6-8 minutes for them to complete and hand them in.

3. After they were done with Vocabulary Knowledge Checklist, the researcher asked participants to fill in a background questionnaire to get more information about them. The questionnaire was completed in 5 minutes.

4. Then, the researcher gave instructions about the task and demonstrated how to log in the website, read the texts, access the glosses for each condition separately and then answer the reading comprehension tests and log out. The participants were told to read the texts carefully and take notes if they needed to be able to answer the comprehension tests because when they finished reading a text, they could not return

back the text while solving the related test. However, the participants were not announced that they were going to take a vocabulary test because the researcher did not want the participants to focus on the target words to an excessive degree and try to memorize them. Instead, the researcher attempted to examine their incidental vocabulary learning. In addition, the participants receiving any combination gloss were reminded that they could click on the highlighted words and look up the glosses in the texts as many times as they wanted. The participants in the group A were given headphones and reminded to listen to audio glosses. The participants were told that they could take a 5-minute break if they needed after they completed the first two reading tests. The time limit for each reading text and test was 20 minutes. The instruction session took 7 minutes.

The treatment stage

5. As soon as the researcher completed the instructions, the participants started to log in with the usernames given to them. The participants in *group A* read the texts with access to English definitions of the highlighted words in the texts, an example sentence, Turkish translation, a picture, the pronunciation of the words with audio recordings of English definitions. The participants in *group B* read the texts with access to English definitions of the target words, a sample sentence for the words, Turkish translations and an illustrative picture for each target word. The ones in *group C* received English definition, Turkish translation and an example sentence for the highlighted words during reading the texts whereas the participants in *group D* got no access to the target words while reading since they were the control group. However, the target words in texts were bolded for the control group to take their attention to the target words as in the case of the three experimental groups.

6. When the participants read the first biography text with respect to the treatment available for their group, they started the test measuring comprehension of the text by clicking 'start quiz' button at the end of the text. After they completed the test they clicked on 'finish the quiz' button, and their answers were recorded. Then they clicked on the 'read Cat in the Rain' to start reading the second text. The process was the same for the second and third reading texts and comprehension tests. A few participants took notes about reading texts. The participants completed the online reading tasks on their own pace (see Appendix P for photos from the study).

7. As soon as they finished solving the third reading comprehension test, they were directed to the vocabulary test consisted of 30 multiple-choice questions. The vocabulary test was the final task of the study that was carried out online. Upon

completing the vocabulary test, the participants clicked on 'finish vocabulary test' and recorded their responses. With the completion of the vocabulary test, the participants logged out the website. All of the participants could finish the online tasks on time while some of them completed the tasks earlier. The vocabulary test took 12-15 minutes to solve.

8. Logging out the website, all participants were administered the attitude and feedback questionnaires. The questionnaires were given to each participant as soon as they finished the online task to gather information about their opinions of the treatment and attitudes towards it. Filling the questionnaires lasted 7-9 minutes. Data collection process in the computer lab ended with the completion of the questionnaires. The treatment and before treatment stages took place in two weeks during 5 sessions. Two of these sessions were conducted in the first week while the remaining three sessions were realized in the second week.

After treatment stage

9. Two weeks after the treatment, the participants were given the unannounced delayed vocabulary test to measure their vocabulary retention. The data for this paper-and-pencil test were collected in the participants' regular classrooms. It took 15 to 18 minutes. The data from the delayed vocabulary tests were collected in 4 sessions within 2 weeks. The first two sessions were conducted in the first week whereas the second two sessions took place in the second week.

10. Finishing data collection for the quantitative phase of the current study, the researcher started to collect qualitative data of the study after the treatment. In the feedback questionnaire the researcher had asked the participants if they wished to participate into the interview, and they needed to leave their contact numbers, and e-mails if they wanted to be interviewed. Choosing three volunteers from each gloss condition group, the researcher got in touch with the interviewees and scheduled a time for each participant. The purpose of the interview was to get an in-depth understanding of the participants' experiences with the texts, the website and the glosses. The interview sessions were completed in three weeks. The interviews were carried out in Turkish.

In conclusion, data collection procedure was completed after the semi-structured interviews were carried out. Except the three pilot studies conducted for the selection of the target words, the design of the website and development of reading comprehension and vocabulary tests, the main data collection procedure was completed in 9 sessions for the experimental study in addition to the interview sessions with twelve participants.

Data Analysis

The quantitative data gathered in the study was analyzed with SPSS 21.0 software. Descriptive statistics including means and standard deviations were carried out, and the results of the analyses were presented with tables. In order to decide on what kind of tests to use for the analysis of quantitative data, first the data were checked whether they were normally distributed around the means (Field, 2009). The normality check was realized for the purpose of determining whether to use parametric tests (such as t-tests, one-way ANOVA) or non-parametric tests (such as Mann-Whitney, Kruskal Wallis) in the data analysis procedure. For the normality analysis, there are two ways generally used in the statistics which are Skewness and Kurtosis values, or Kolmogorov-Smirnov or Shapiro-Wilk tests. In this research, skewness and kurtosis values were calculated to examine the normality of quantitative data. The data for each reading comprehension and vocabulary test in addition to the attitude questionnaire and data from tracking tool were examined in the SPSS for normality check. The Table 7 indicates the distribution of samples from the mean.

Table 7. *Descriptive Statistics: The Results of Normality Check*

Samples	**Number of items**	**Skewness**	**Kurtosis**
Reading Test1	15	-.267	-.659
Reading Test2	15	-.241	.054
Reading Test3	15	-.563	.625
Reading Tests. in total	45	-.235	-.391
Immediate Voc. Test1	10	-.404	.864
Immediate Voc. Test2	10	-1.081	1.338
Immediate Voc. Test3	10	-.634	-.495
Immediate Voc. T in total	30	-.839	.584
Delayed Voc. Test1	10	-.502	-.786
Delayed Voc. Test2	10	-.891	.438
Delayed Voc. Test3	10	-.533	-.312
Delayed Voc. T in total	30	-.755	-.266
Frequency of Access	30	.317	.700
Attitude Quest.	9	.070	-.406

The table 7 shows the skewness and kurtosis values of samples in each given data collection instrument. The skewness and kurtosis values change between +1.5 and -1.5 throughout all of the data results which could be regarded as normally distributed according to Tabachnick and Fidell (2013), indicating that all of the data were normally distributed. As a result, parametric tests were used for the analysis of quantitative tests in the present study.

In order to answer the research question 1 and 2 which are related to investigate whether there is a significant difference among all of the experimental groups (text, textual+ pictorial, textual+ pictorial+ audio and control group) in terms of the participants' immediate and delayed vocabulary learning and reading comprehension test scores, one-way ANOVA analysis was manipulated, and all these analyses were done between group comparisons. For the research question 2.3., within group analysis was carried out with t-tests. The research question 2.4 which examines the relationship between frequent access to glosses and L2 learners' immediate and delayed vocabulary scores was answered with the correlation analysis of data gathered from the tracking tool and from the scores of immediate and delayed vocabulary tests.

Additionally, paired sample t-tests were applied to answer the third research question exploring if there is a significant difference among the different glossed text genres within each experimental group in terms of the learners' reading comprehension and delayed vocabulary test scores.

Descriptive statistics were used to examine L2 learners' attitudes towards online glosses and one-way of ANOVA test was also utilized to examine if there is a significant difference between the experimental groups in terms of the participants' attitudes which constitutes the fourth research question

To answer the last research question exploring the participants' opinions and experiences about the treatment, the data collected through feedback questionnaire was descriptively analyzed from a qualitative perspective, and the qualitative data gathered from semi-structured interviews were analyzed through content analysis.

CHAPTER FOUR

Results

This chapter presents the results of the study based on the procedures described in the previous chapter. Both quantitative and qualitative analyses were conducted in order to answer the research questions. Descriptive and inferential statistics were referred for quantitative analyses whereas descriptive and content analyses were adopted for qualitative analyses. The results of the analyses conducted are discussed in 6 sections. The first section describes the characteristics of the participants with respect to their demographic and background information. The second section reports the results of the analyses to answer the first research question which is about the effects of mediated glosses on L2 reading comprehension scores of the participants. The third section is about the findings from the analyses that were carried out to examine the effects of mediated glosses on L2 vocabulary learning and retention scores of the participants. The fourth section, on the other hand, presents the analysis of the third research question investigating the effects of text type on both L2 reading comprehension and vocabulary performances of the participants. In the following section the results of the attitude questionnaire are explained while the final section presents the findings from feedback questionnaires and interviews to understand the participants' perceptions, opinions and experiences about the implementation.

Descriptive Results for Participant Backgrounds

This section deals with the demographic and background information of the L2 learners participating in the current research. The participants were administered a background questionnaire to learn more about their characteristics and proficiency in English language. Having more information about the background of the participants was necessary and valuable for understanding, interpreting, discussing and generalizing the results of the study. The data gained through the background questionnaire were analyzed descriptively and presented with tables in this section.

The participants of the experimental part of the study consisted of 119 college students majoring in an ELT program at a state university in Turkey. The participants were randomly assigned to four groups, three of which included thirty participants, and one of which consisted of twenty-nine students. The information about the age, gender and grade level of

the participants was explained in the previous chapter on group basis. For this reason, they were not included in this section again.

In terms of the responses the participants gave about their proficiency level in Table 8, 80 participants responded their proficiency level as 'upper-intermediate' while 32 participants responded as 'intermediate'. 4 of the participants regarded their level as pre-intermediate whereas 3 participants responded as 'advanced'. The groups seemed to be similar in their responses to their proficiency level. When their responses to their cumulative grade point of average in their department were examined as presented in Table 9, it could be seen that most of the participants had grade point of average between 2.50 and 3.40 out of 4.00. Some of the participants had 1.50- 2.40 grade point of averages which were distributed equally among the groups. The highest grade point of averages, which were between 3.50- 4.00, were distributed equal in groups B, C and D but in group A, there was only one student in that range. However, the groups also appeared to be comparable with respect to their cumulative grade point of averages.

Table 8. *Proficiency Levels of the Participants*

		Pre-intermediate	**Intermediate**	**Upper-intermediate**	**Advanced**	**Total**
Group	A	1	9	20	0	30
	B	1	8	20	1	30
	C	1	8	21	0	30
	D	1	7	19	2	29
Total		4	32	80	3	119

Table 9. *Cumulative Grade Point of Average of the Participants*

		3.50- 4.00	**2.50- 3.40**	**1.50- 2.40**	**0.50- 1.40**
Group	A	1	23	6	0
	B	4	20	6	0
	C	4	19	7	0
	D	4	19	6	0
Total		13	81	25	0

The participants were asked how many hours they studied English outside of the class per day (question 8), at which level they started learning English at school (question 9), how long they had studied English (question 10), and which language skills they used in English

most of the time (question 11). The participants' responses to these questions were summarized in Table 10. Almost half of the participants (N=60) responded that they studied English 1 or 2 hours a day while 31% of the participants (N=37) studied less than an hour and 12% of the participants (N=15) studied 2 or 3 hours. On the other hand, 5% of the participants (N=7) spent more than 3 hours in studying English outside of the class. The control group's (D) responses indicated that they studied English more per day than the experimental groups did.

Table 10. *Frequency of Participants' Responses to Questions 8, 9, 10 and 11*

		A	**B**	**C**	**D**	**Total**
Q8	Less than 1 h.	7	11	11	8	37
	1-2 hours	18	14	13	15	60
	2-3 hours	3	4	4	4	15
	More than 3 h.	2	1	2	2	7
Q9	Kindergarten	1	1	4	0	6
	Primary level	21	24	17	22	84
	Secondary level	8	5	9	7	29
Q10	1-3 years	1	0	0	2	3
	3-5 years	2	5	3	1	11
	5-7 years	10	4	5	4	23
	More than 7 y.	17	21	22	22	82
Q11	Writing	13	16	11	10	50
	Speaking	9	7	9	9	34
	Reading	21	22	26	23	92
	Listening	23	17	23	20	83

Considering the participants' responses to the level of starting to learn English (Q9), the results showed that the majority of the participants (70%, N=84)) began English learning at primary level while 24% of the participants (N=29) started at secondary level. The groups did not differ much in their responses to the question 9. Additionally, when the participants' responses to the question 10 were examined, it could be found that 82 participants had studied English for more than 7 years. However, 23 participants reported that they had studied English for 5 to 7 years whereas 11 participants had studied for 3 to 5 years. In general, group A receiving textual+ pictorial +audio gloss seemed to have more participants studying English less than the other groups regarding the years spent on learning English. The responses of the participants to the question 11 demonstrated that the participants used reading (N=92) and

listening (N=83) skills more than they used speaking (N=34) and writing (N=34) skills. Among these four skills the mostly used one was reading while the least used one was speaking for the participants of the study. The groups were not much different from each other in term of the skills they used in English according to the frequencies given in the Table 10. This research was based on the participants' reading skills, which was the mostly used skill by the participants of the study. Their listening, speaking and writing skills in English were not assessed in this research.

With a 5-point Likert scale, the question 12 asked the participants to rate their proficiency (1: Poor, 2: Fair, 3: Average, 4: Good, 5: Excellent) in terms of foreign language learning, reading in English, reading in Turkish and computer skills. As presented in Table 11, the vast majority of the participants (N=103) rated their proficiency as a foreign language learner as 'average' and 'good'. 6.7% of the participants (N=8) rated as 'excellent' while 5% of the participants (N=6) rated as 'fair'. There was one student rating his proficiency as 'poor' in foreign language learning. In the same vein, the participants mostly rated their reading proficiency in English as 'good' (N=59) and 'average' (N=45). There were also 8 participants rating their reading proficiency in English as 'excellent'. On the other hand, a great number of the participants rated their reading proficiency in Turkish as 'good' (N=53) and 'excellent' (N=50), which was understandable since the native languages of all participants except one learner was Turkish. As for the computer skills, the majority of the participants rated their proficiency either as 'average' (N=40) and 'good' (N=41). 18 participants rated their computer skills as 'excellent' and 13 participants rated as 'fair'. Only one participant rated his proficiency in computer skills as 'poor'. These results suggested that the participants did not differ much from each other with regard to their ratings for the question 12.

Table 11. *Frequency of Participants' Responses to the Question 12*

	1: Poor	2: Fair	3: Average	4: Good	5: Excellent
FL learner	1	6	61	43	8
Reading in English	1	4	45	59	10
Reading in Turkish	1	4	11	53	50
Computer Skills	7	13	40	41	18

The participants' use of dictionary was also questioned in this questionnaire. They were inquired about how often they used a dictionary while studying English. The participants were expected to choose from the five options which were 'often, usually, sometimes, rarely and never'. The responses of the participants in each group were demonstrated in Table 12. 48 participants responded that they sometimes used a dictionary whereas 44 participants

responded that they rarely used it while studying English. However, 14 participants reported their frequency of dictionary use as 'usually' and 9 participants reported that they had never used a dictionary. Only 4 participants responded that they often used a dictionary. As a result, the participants did not seem to use dictionary much while studying English.

Table 12. *Frequency of the Participants' Dictionary Use*

		Often	**Usually**	**Sometimes**	**Rarely**	**Never**
Group	A	1	2	11	13	3
	B	1	3	7	15	4
	C	1	7	18	4	0
	D	1	2	12	12	2
Total		4	14	48	44	9

Effects of Multimedia Glosses on L2 Reading Comprehension

The first research question asks whether different types of mediated glosses have an impact in enhancing reading comprehension of L2 learners in a hypermedia environment. The groups (three experimental groups and one control group) were compared in terms of their total scores in three reading comprehension tests. In order to get the participants' scores in reading comprehension tests in sum, descriptive statistics for reading comprehension were run and illustrated in Table 13.

The Table 13 indicated that the lowest scores were received by group D which was the control group (M=24.27, SD= (3.49). On the other hand, the three experimental groups (A, B, and C) performed better than the control group (D) on reading comprehension tests because they got higher mean scores (M=31.90, M=27.76, M=27 respectively) compared to the control group (M=24.27). Among the four groups, it was group A (textual+ pictorial+ audio gloss) which had the highest mean score (M=31.90) on reading comprehension tests. Then the group B (textual+ pictorial) had the second highest mean scores (M=27.76) on the reading comprehension tests in sum. The group C (textual gloss) followed the group B with a very close mean score (M=27) and had the third highest mean score. In conclusion, the group receiving the combination of textual, pictorial and audio glossing performed best on reading comprehension tests while the control group with no access to any gloss had the lowest mean scores on the same tests in sum. The groups receiving the combination of textual and pictorial glossing, and textual glossing only had similar mean scores (M=27.76; M=27) in the reading comprehension tests but performed better than the control group.

Table 13. *Descriptive Statistics of Reading Comprehension Scores*

Groups	**N**	**M**	**SD**	**SE**	**95% CI for M**		**Min**	**Max**
					LB	**UB**		
A	30	31.90	3.19	.58	30.70	33.09	25.00	38.00
B	30	27.76	4.69	.85	26.01	29.52	19.00	37.00
C	30	27.00	4.68	.85	25.25	28.74	15.00	35.00
D	29	24.27	3.49	.64	22.94	25.60	16.00	31.00
Total	119	27.76	4.86	.44	26.88	28.64	15.00	38.00

M: Mean, SD: Standard Deviation, SE: Standard Error, LB: Lower Bound, UB: Upper Bound

To further address the first research question asking whether the exposure to different mediated glosses has any significant effect on L2 reading comprehension of native Turkish speakers or not, a One-Way Analysis of Variance (ANOVA) was conducted. In order to check homogeneity of variances Levene's Test was applied to ensure whether groups were homogeneous and had equal variances (Levene, 1960). This test was used for between participant comparisons in this study as shown in Table 14.

Table 14. *Test of Homogeneity of Variances of Reading Comprehension Scores*

Levene Statistic	**df1**	**df2**	**P**
4.339	3	115	.006

The p value of this test should be greater than 0.05 to assume the homogeneity of variances. For this analysis, the p value was smaller than 0.05, meaning that the variances were not equal among the groups. In the case where the assumption of the homogeneity of variances is not met, the f and p values of Welch or Brown- Forsythe are used for ANOVA results (Field, 2013). Since this assumption was not perceived in this situation, the results of Welch test were used for the analysis. According to Table 15, there was a significant difference between groups in terms of their total scores in reading comprehension tests since the significance value (.000) was smaller than .005.

Table 15. *ANOVA Results for Reading Comprehension Scores*

	Statistic[a]	**df1**	**df2**	**p**
Welch	25.753	3	63.157	.000

a. Asymptotically F distributed.

Table 16. *Multiple Comparisons for Reading Comprehension*

(I) Gr.	**(J) Gr.**	**MD (I-J)**	**SD**	**p**	**95% Confidence Interval**	
					LB	**UB**
Group A	B	4.13*	1.03	.001	1.29	6.97
	C	4.90*	1.03	.000	2.06	7.73
	D	7.62*	.87	.000	5.24	10.00
Group B	A	-4.13*	1.03	.001	-6.97	-1.29
	C	.76	1.21	.989	-2.53	4.06
	D	3.49*	1.07	.012	.55	6.42
Group C	A	-4.90*	1.03	.000	-7.73	-2.06
	B	-.76	1.21	.989	-4.06	2.53
	D	2.72	1.07	.082	-.20	5.65
Group D	A	-7.62*	.87	.000	-10.00	-5.24
	B	-3.49*	1.07	.012	-6.42	-.55
	C	-2.72	1.07	.082	-5.65	.20

* The mean difference is significant at the 0.05 level.

Although this analysis revealed that there was a meaningful difference between groups, it was not understood from this analysis which group/s differed from the others significantly. To this end, post-hoc analyses (multiple comparisons) were carried out in order to see the differences between groups in detail. Since the equal variances were not assumed, Tamhane's T2 test, which is one of the tests used in the case of unequal variances for post-hoc

analyses, was preferred for multiple comparisons (Kalaycı, 2010). The results of the post hoc comparisons were illustrated in Table 16.

As shown in the Table 16, the largest mean difference was between group A (textual+ pictorial+ audio glossing) and D (control) (MD=7.62), meaning that among the experimental groups, group A was the most significantly different group in comparison to the control group. Group B also performed significantly different from the group D (control) ($p<0.05$) whereas the difference between group C and group D (control) was not significant ($p>0.05$) in terms of reading comprehension test scores in sum. Apart from group C, the other two experimental groups (A and B) performed significantly better than the group D (control) on reading comprehension tests, meaning that the combination of textual and pictorial glossing or the combination of textual, pictorial and auditory glossing was significantly more effective than single textual glossing on reading comprehension performances of the participants compared to the control group. When the experimental groups were compared among each other, it could be seen that group A was significantly different from both group B and group C ($p<0.05$) whereas the difference between group B and C was not significant ($p>0.05$). In other words, the combination of textual, pictorial and auditory glossing was more effective on L2 learners' reading comprehension tests in sum than the combination of textual and pictorial glossing, and single textual glossing. On the other hand, single textual glossing and textual+ pictorial glossing seemed to be similarly effective for the L2 learners' reading comprehension performance.

Effects of Multimedia Glosses on L2 Vocabulary Learning and Retention

The second research question investigates whether exposure to the different types of mediated glosses has any impact on vocabulary learning performances of the L2 learners. To find answer to this question, first of all the descriptive statistics of the vocabulary test scores were carried out, and then to understand whether there was a significant effect of glossing on vocabulary learning, variances of analysis were conducted. The same analysis procedure was applied for delayed vocabulary retention test. Finally, to see the difference between immediate and delayed vocabulary test scores within participants, paired sample t-test was manipulated for the analysis of the research question 2.3. For the sub-question 2.4, enquiring the relationship between the frequency of access to glosses and performances of the participants on L2 immediate vocabulary and delayed vocabulary tests, correlation analysis was used.

Effects of multimedia glosses on L2 vocabulary learning.

Firstly, the scores of each group on the immediate vocabulary test were analyzed descriptively and illustrated in Table 17.

Table 17. *Descriptive Statistics of Immediate Vocabulary Test Scores*

Groups	**N**	**M**	**SD**	**SE**	**95% CI for M**		**Min.**	**Max.**
					LB	**UB**		
A	30	25.70	2.64	.48	24.71	26.68	16.00	30.00
B	30	22.76	3.10	.56	21.60	23.92	15.00	28.00
C	30	22.50	3.92	.71	21.03	23.96	9.00	30.00
D	29	17.55	4.51	.83	15.83	19.26	8.00	28.00
Total	119	21.13	4.60	.42	21.33	23.00	8.00	30.00

M: Mean, SD: Standard Deviation, SE: Standard Error, LB: Lower Bound, UB: Upper Bound

The descriptive analysis of immediate vocabulary test scores in Table 17 showed that groups A, B and C performed better than group D on immediate vocabulary test since the mean scores of them were higher than the group D. The highest mean score in immediate vocabulary test was received by group A (M=25.70, SD=2.64). The second highest scores belonged to the group B (M=22.76. SD=3.10), and then the group C with a mean score of 22.50, SD=3.92 ranked the third on the immediate vocabulary test. The mean scores of the group B and group C was very close. The lowest mean score; on the other hand, was received by the group D (M=17.55, SD=4.51), meaning that all three of the experimental groups had higher mean scores on the immediate vocabulary test than the control group. However, among the experimental groups, the group receiving the combination of textual, pictorial and audio glossing performed best with the highest mean scores (M=25.70, SD=2.64) on the immediate vocabulary test in sum.

The descriptive results revealed that there were differences among the groups having different types of glossing, but more analysis was required to determine whether these differences were statistically significant or not. For this reason, One-way Analysis of Variances (ANOVA) was carried out. For this analysis the groups were compared with each other in terms of their performances on the immediate vocabulary test. The normality assumption of the ANOVA had been met regarding skewness and kurtosis values as described in the previous chapter (Table 7). The assumption of homogeneity of variances was tested with Levene's test, and the result of this test was presented in Table 18.

Table 18. *Test of Homogeneity of Variances of Immediate Vocabulary Test Scores*

Levene Statistic	**df1**	**df2**	**p**
2.153	3	115	.097

As seen in the Table 18, Levene's test demonstrated that the homogeneity of variances for the immediate vocabulary tests scores was met since p value was bigger than 0.05 (p=.097), meaning that the variances were normally distributed for the immediate vocabulary test.

Table 19. *ANOVA Results for Immediate Vocabulary Scores*

	SS	**df**	**MS**	**F**	**p**
Between Groups	1006.30	3	335.43	25.71	.000
Within Groups	1500.33	115	13.04		
Total	2506.63	118			

SS: Sum of Squares. MS: Mean Square

As shown in Table 19, the one-way ANOVA results indicated that there was a significant difference among the groups regarding the effects of glossing type on the immediate vocabulary test since the p value of this analysis was smaller than 0.05, F(3,118)=25.71, p=.000. This result suggested that at least one of the groups performed significantly different from the others on the immediate vocabulary test. More analysis was needed to further investigate which group/s performed significantly different from each other. For this purpose, post-hoc comparisons were manipulated using the Bonferonni procedure, which is one of the tests used in the post hoc comparisons of ANOVA (Field, 2013). The results were presented in Table 20.

According to the results obtained in the post hoc comparison analysis to examine the effects of the different glossing types on L2 vocabulary learning of the participants, there were some significant differences between groups with respect to their immediate vocabulary test scores. The group D's scores on the vocabulary test were significantly different from group A, B and C since p values of the group comparisons were smaller than 0.05 (p=.000) for all three groups. This result meant that each of the experimental groups was significantly better than the control group on vocabulary learning. Therefore, it could be concluded that glossing irrespective of the type (textual, pictorial or audio) was significantly effective on L2 vocabulary learning of the participants.

Table 20. *Multiple Comparisons for Immediate Vocabulary Scores*

(I) Gr.	(J) Gr.	MD (I-J)	SE	p	95% Confidence Interval	
					LB	UB
A	B	2.93*	.93	.013	.42	5.43
	C	3.20*	.93	.005	.69	5.70
	D	8.14*	.94	.000	5.62	10.67
B	A	-2.93*	.93	.013	-5.43	-.42
	C	.26	.93	1.000	-2.23	2.77
	D	5.21*	.94	.000	2.68	7.74
C	A	-3.20*	.93	.005	-5.70	-.69
	B	-.26	.93	1.000	-2.77	2.23
	D	4.94*	.94	.000	2.42	7.47
D	A	-8.14*	.94	.000	-10.67	-5.62
	B	-5.21*	.94	.000	-7.74	-2.68
	C	-4.94*	.94	.000	-7.47	-2.42

* The mean difference is significant at the 0.05 level.

When the experimental groups were compared to each other, the results showed that group A was significantly different from group B and C as p value of the group A was smaller than 0.05 in comparison to the group B (p=0.13), and group C (p=.005) but, no significant differences were found between the experimental groups B and C with respect to vocabulary learning scores since the p value was bigger than 0.05 between group B and C (p=1.000). This meant that the combination of textual, pictorial and audio glossing was the most effective glossing mode on L2 vocabulary learning of the participants compared to textual+ pictorial glossing condition and single textual glossing condition in this study. Thus, it could be concluded that audio glossing combined with the textual and pictorial gloss seemed to have significantly positive impact on L2 vocabulary learning in comparison to single textual gloss or the combination of textual and pictorial gloss.

Effects of multimedia glosses on L2 vocabulary retention.

To answer the research question 2.2 investigating the effects of mediated glosses on L2 vocabulary retention of the participants, the data gathered from the delayed vocabulary test were analyzed descriptively and provided in Table 21. The purpose of this analysis was to explore the differences among the groups in terms of their performances on the delayed vocabulary test and to investigate which glossing condition had a meaningful impact on L2

learners' word retention. In the delayed vocabulary test, four of the participants taking immediate vocabulary tests were absent, and thus, the data from these participants could not be collected. Two participants from group C, one participant from group B and one participant from group D did not take the delayed vocabulary test. Therefore, in the delayed vocabulary test, there were 115 participants from the main study.

Table 21. *Descriptive Statistics for Delayed Vocabulary Test Scores*

Groups	**N**	**M**	**SD**	**SE**	**95% Conf. Int. for M**		**Min.**	**Max.**
					LB	**UB**		
A	30	22.16	2.66	.48	21.17	23.16	15.00	27.00
B	29	20.17	3.01	.55	19.02	21.31	11.00	26.00
C	28	18.07	4.61	.87	16.28	19.85	5.00	25.00
D	28	10.64	3.95	.74	9.10	12.17	3.00	22.00
Total	115	17.86	5.64	.52	16.81	18.90	3.00	27.00

M: Mean. SD: Standard Deviation. SE: Standard Error. LB: Lower Bound. UB: Upper Bound

The results depicted in Table 21 demonstrated that the lowest mean score was received by the group D (M=10.64. SD=3.95) while the group A had the highest mean score on the delayed vocabulary test (M=22.16, SD= 2.66). The second highest mean score was obtained by the group B (M=20.17. SD=3.01) whereas the group C followed the group B on the delayed vocabulary test scores (M=18.07. SD=4.61). Consequently, groups A, B and C performed better on the tests compared to the group D, meaning that the experimental groups had higher mean scores than the control group on the delayed vocabulary test. This result suggested that glossing appeared to have an effect on L2 word retention in comparison to no glossing situation and there were differences between experimental groups in terms of mean scores received on the delayed vocabulary test.

The descriptive analysis revealed differences among groups; however, this analysis was not enough to determine whether this difference was statistically meaningful or not. To further examine the significance of this difference, one-way ANOVA was carried out. First Levene's test was checked for the assumption of homogeneity of variances, and its result was displayed in Table 22. The p value in the result of this test was found to be bigger than 0.05 (p=.142), indicating that the variances were equally distributed, and ANOVA can be used for the analysis. The Table 23 indicated the ANOVA results of delayed vocabulary test. According to the ANOVA table results, the difference among the groups was found to be

significant with respect to the delayed vocabulary test scores because p value was smaller than 0.05; F(3,114)=55.15, p=.000. This analysis showed that there was a significant effect of glossing on L2 word retention of the participants.

Table 22. *Test of Homogeneity of Variances of Delayed Vocabulary Test Scores*

Levene Statistic	**df1**	**df2**	**p**
1.851	3	111	.142

To investigate which groups were significantly different from each other and to understand which glossing type had a significant effect and thus more effective on L2 word retention, multiple comparisons of the groups were carried out through post-hoc analysis. The delayed vocabulary scores of each group were compared to the scores of other groups for this analysis. The results of the post hoc analysis carried out with Bonferonni test were presented in Table 24.

Table 23. *ANOVA Results for Delayed Vocabulary Scores*

	SS	**df**	**MS**	**F**	**p**
Between Groups	2171.18	3	723.72	55.15	.000
Within Groups	1456.59	111	13.12		
Total	3627.77	114			

As can be seen in Table 24, there were meaningful differences between groups. For instance, the groups A, B and C were significantly different from the group D, meaning that the experimental groups performed better than the control group on the delayed vocabulary test. The biggest mean difference was between group A and D (MD=11.52, p=.000), and then the second biggest difference were between group B and D (MD=9.52, p=.000). The mean difference between group C and D was 7.42 with p=.000. This result meant that glossing had significant impact on L2 word retention of the participants in comparison to no glossing condition.

Table 24. *Multiple Comparisons for Delayed Vocabulary Scores*

(I) Gr.	(J) Gr.	MD (I-J)	SE	p	95% Confidence Interval	
					LB	UB
A	B	1.99	.94	.221	-.53	4.52
	C	4.09*	.95	.000	1.53	6.65
	D	11.52*	.95	.000	8.96	14.08
B	A	-1.99	.94	.221	-4.52	.53
	C	2.10	.95	.184	-.47	4.67
	D	9.52*	.95	.000	6.95	12.10
C	A	-4.09*	.95	.000	-6.65	-1.53
	B	-2.10	.95	.184	-4.67	.47
	D	7.42*	.96	.000	4.82	10.02
D	A	-11.52*	.95	.000	-14.08	-8.96
	B	-9.52*	.95	.000	-12.10	-6.95
	C	-7.42*	.96	.000	-10.02	-4.82

*The mean difference is significant at the 0.05 level.

When the differences between the experimental groups were considered, it could be understood from the table that the difference between group A and B was insignificant (MD=1.99, p=.221) whereas the difference between group A and C was statistically significant (MD=4.09, p=000), meaning that the combination of textual, pictorial and audio glossing condition was more effective than single textual glossing condition in the enhancement of the retention of L2 vocabulary. However, the effectiveness of textual+ pictorial+ audio gloss compared to the textual+ pictorial gloss on L2 word retention was not significant, meaning that they had similar impact in terms of L2 vocabulary retention. On the other hand, the experimental groups B and C did not significantly differ from each other regarding their effects on delayed vocabulary test scores (MD=2.10, p=.184). Taking into account of all groups' scores on the delayed vocabulary test, it could be inferred that the group A receiving textual+ pictorial+ audio gloss seemed to have significantly positive impact on L2 word retention compared to the group C receiving textual gloss only. In general, it

appeared from these results that glossing technique contributed to the participants' L2 word retention significantly.

Effects of the multimedia glosses on L2 vocabulary learning versus L2 vocabulary retention.

The aim of this comparison was to investigate whether the target words were remembered two weeks after the treatment, and whether there was significant difference between L2 learners' scores from immediate vocabulary test to the delayed vocabulary test, which was the research question 2.3. To this end, each group's scores from immediate vocabulary test and delayed vocabulary test were compared with each other separately with a within-participant paired samples t-test. For each group, paired sample t-test was conducted separately. The table 25 demonstrated the findings from descriptive statistics of the paired samples t-tests.

When the Table 25 was examined, it could be seen that in all groups, the mean scores from immediate vocabulary tests were different from delayed vocabulary test scores. For instance, in group A, while the mean of immediate vocabulary test was 25.70 with SD=2.64, the mean of delayed vocabulary test was 22.16 with SD=2.6. There was a decrease in the performances of the participants on vocabulary retention test in group A. When all of the groups' scores were examined, it could be clearly understood that immediate vocabulary scores were higher than delayed vocabulary test scores, meaning that the participants did not do well in the delayed vocabulary test compared to immediate vocabulary test.

Table 25. *Paired Samples Statistics of Immediate and Delayed Vocabulary Scores*

		M	**N**	**SD**	**SEM**
Gr. A	Immediate Voc. Test	25.70	30	2.64	.48
	Delayed Voc. Test	22.16	30	2.66	.48
Gr. B	Immediate Voc. Test	22.86	29	3.11	.57
	Delayed Voc. Test	20.17	29	3.01	.55
Gr. C	Immediate Voc. Test	22.25	28	3.94	.74
	Delayed Voc. Test	18.07	28	4.61	.87
Gr. D	Immediate Voc. Test	17.64	28	4.57	.86
	Delayed Voc. Test	10.64	28	3.95	.74

M: Mean, N: Number of the participants, SD: Standard Deviation, SEM: Standard Error Mean

The Table 26 demonstrated the paired sample t-test results in detail in order to understand if the difference was significant or not for each group. The results of the paired sample t-test indicated that in group A taking the combination of textual, pictorial and audio glossing, there was a statistically significant decrease regarding vocabulary performances of the participants from the immediate vocabulary test (M=25.70, SD=2.64) to delayed vocabulary test (M=22.16, SD=2.66); t(29)=8.00, p=.000 (two-tailed). The mean difference of these tests was 3.53 with a 95% confidence interval of difference from 2.63 to 4.43. As for group B similarly, the decrease from immediate test result (M=22.86, SD=3.11) to delayed test score (M=20.17, SD=3.01 was significant; t(28)=10.04, p=.000 with mean difference 2.68, interval of difference ranging from 2.14 to 3.23 with 95% confidence. Likewise, the group C comparison showed a significant decrease from immediate vocabulary test (M=22.25, SD=3.94) to delayed vocabulary test (M=18.07, SD=4.61); t(27)=80.60, p=.000. The mean decrease was 4.17 with 95% CI (3.18-5.17) in group C. A closer look at the findings of group D revealed that the participants' scores significantly decreased (M=7.00, SD=4.36); t(27)=8.48, p=.000 from immediate vocabulary test (M=17.64, SD=4.57) to delayed vocabulary test (M=10.64, SD= 3.95).

Table 26. *Paired Samples Test Results of Immediate versus Delayed Vocabulary Scores*

		Paired Differences					**t**	**df**	**p (2-tailed)**
		M	**SD**	**SEM**	**95% CI. Of the Difference**				
					L	**U**			
Gr.A	Immediate V. Delayed Voc.	3.53	2.41	.44	2.63	4.43	8.00	29	.000
Gr.B	Immediate.V. Delayed Voc.	2.68	1.44	.26	2.14	3.23	10.04	28	.000
Gr.C	Immediate.V. Delayed Voc.	4.17	2.56	.48	3.18	5.17	8.60	27	.000
Gr.D	Immediate.V. Delayed Voc.	7.00	4.36	.82	5.30	8.69	8.48	27	.000

M: Mean. SD: Standard Deviation. SE: Standard Error. LB: Lower Bound. UB: Upper Bound, CI: Confidence Interval

Considering all groups, the participants' immediate test scores were significantly better than their delayed test scores meaning that the participants did not recall the target words two weeks later as much as they did right after the study. The biggest decrease was in the control group (D), which was understandable since this group did not take any glossing. However, the experimental groups (A, B, C) also forgot some of the target words they had

learned, meaning that glossing did not contribute significantly to their word retention in comparison to their vocabulary learning. However, group A and B seemed to retain the learned words more than group C, meaning that the addition of picture and sound into textual glosses resulted in more retention of learned words compared to textual only gloss when measured two weeks later.

Effects of the frequency of access to glosses.

This analysis was carried out to find an answer to the research question 2.4 investigating whether there was a relationship between the number of getting access to glosses and vocabulary learning. To this end, first of all descriptive results of the number of clicking on the target words and thus getting access to the glosses were calculated for each experimental group except the control group (no gloss) and illustrated in Table 27.

Table 27. *Descriptive Statistics of the Frequency of Access to Glosses*

	N	**M**	**SD**	**SE**	**95% CI for Mean**	
					LB	**UP**
A	30	32.80	11.30	2.06	28.57	37.02
B	30	34.03	9.26	1.69	30.57	37.49
C	29	30.00	7.87	1.46	27.00	32.99
Total	89	32.30	9.64	1.02	30.27	34.33

M: Mean. SD: Standard Deviation. SE: Standard Error. LB: Lower Bound. UB: Upper Bound, CI: Confidence Interval

The descriptive results of frequency of access to glosses as represented in Table 27 showed that the experimental groups differed from each other in terms of their clicking behavior. The highest mean frequency was received from the group B (M=34.03, SD=9.26) with a 95% confidence interval ranging from 30.57 to 37.09. After the group B, group A had the second highest mean frequency (M=32.80, SD=11.30). Among the experimental groups group C had the lowest mean of clicking frequency (M=30.00, SD=7.87). These results suggested that the group receiving textual and pictorial gloss clicked on the target words more than the group receiving the combination of textual, pictorial and audio glossing, and the group getting access to textual gloss.

Table 28. *ANOVA Results for Frequency of Access to Glosses*

	SS	**df**	**MS**	**F**	**p**
Between Groups	251.04	2	125.52	1.36	.262
Within Groups	7931.76	86	92.23		
Total	8182.80	88			

SS: Sum of Squares, MS: Mean Square

To examine whether groups differed from each other significantly or not with regard to the number of clicking target words, one-way ANOVA was conducted. The assumption of homogeneity of variances was ensured with Levene test with p=.419 which was bigger than .05. Since variances were regarded as homogenous, ANOVA analysis was realized and the results of this analysis were presented in Table 28. As seen in the table, the difference between the experimental groups regarding the frequency of access to glosses was not found to be significant, F(2,88)=1.36, p=.262, meaning that the groups were similar in terms of number of clicking the target words. It could be concluded that the participants in each experimental group seemed to access glosses in similar frequencies.

Even though no significant differences were found among the experimental groups regarding their frequency of access to glosses, which was measured by the number of clicking on the target words, clicking behaviors of the participants needed to be further investigated to understand whether there was a relationship between the number of access to glosses and vocabulary learning, and word retention. For this purpose, Pearson Correlation Analysis was run between the frequency of access to glosses and immediate vocabulary test scores as well as delayed vocabulary test scores. The results of this analysis were provided in Table 29.

Table 29. *Correlation Analysis Results of Access Frequency and Immediate-Delayed Voc. Scores*

	N	**r**	**p (2-tailed)**
Immediate Voc. Test	90	.145	.177
Delayed Voc. Test	87	.072	.500

The analysis of correlation between the number of getting access to glosses and vocabulary test scores (immediate and delayed) revealed that the correlation was not significant between the frequency of access and both the immediate (p=.177) and delayed test scores (p=.500) as p values for vocabulary tests were greater than .05. On the other hand, correlation coefficient values indicated that there was a positive relationship between the number of accessing the glosses and the immediate vocabulary test scores (r=.145), and the

delayed vocabulary test scores (r=.072), but this relationship was found to be very weak since the groups had similar clicking frequencies.

Effects of Text Types on L2 Reading Comprehension and Vocabulary Retention

The research question 3 investigates the effects of the text types on L2 learners' reading comprehension and vocabulary retention. To answer this question, t-tests were used for the analysis. In this study, three kinds of texts were read by the participants under different glossing conditions. There was a reading comprehension test related to each text and a vocabulary test consisting of ten target words included in each text. The text types were a biography, a short story and a textbook article. For each group, paired sample t- tests were conducted between the participants' reading comprehension and vocabulary retention test scores in each text.

Effects of text types on L2 reading comprehension.

In this analysis, each group's reading comprehension scores in each text type were compared to those in the second and third text types. Since groups were different from each other in terms of the glossing they received, within group analysis was carried out instead of between groups analysis to examine whether using different text types had any significant impact on the L2 learners' reading comprehension scores, which was the research question 3.1. That is why, for each group, paired samples t-test was applied separately and results of this analysis were presented together in Table 30 descriptively.

When the mean scores received by the participants in each group as presented in Table 30 were examined, it could be seen that there were differences in the participants' scores in each reading test in relation to reading texts. The differences existed both within group as well as between group bases. When groups were compared to each other in terms of their scores in each test, a gradual decline was found in the participants' performances from group A to B and from group B to C and from group C to group D. To exemplify, the mean scores in the biography reading comprehension test for each group revealed that the highest mean score was received by the participants in group A (M=10.46, SD=1.63), and then by group B (M=9.10, SD=2.39). After the group B, the group C had higher mean scores in biography test (M=8.66, SD=2.27) than the group D (M=8.03, SD=1.61). This decline was found in the short story and textbook article reading comprehension tests, as well. This gradual decrease in mean scores from reading comprehension tests between groups was not surprising, since the groups received different glossing types while they were engaged in reading the texts. The information they got in their glosses also reduced from the group A to group D. The most

features in glosses were received by group A (textual+ pictorial+ audio gloss). The group B received textual+ pictorial gloss while group C received only textual gloss. On the other hand, group D got no gloss in the study. In line with the number of information presented in glosses in each group, their reading comprehension scores in each test appeared to differ.

Table 30. *Paired Samples Statistics of Reading Comprehension Tests Scores Separately*

		M	**N**	**SD**	**SEM**
Group A	Biography	10.46	30	1.63	.29
	Short Story	11.40	30	1.69	.30
	Biography	10.46	30	1.63	.29
	Textbook Article	10.03	30	1.56	.28
	Short Story	11.40	30	1.69	.30
	Textbook Article	10.03	30	1.56	.28
Group B	Biography	9.10	30	2.39	.43
	Short Story	9.93	30	1.57	.28
	Biography	9.10	30	2.39	.43
	Textbook Article	8.73	30	2.42	.44
	Short Story	9.93	30	1.57	.28
	Textbook Article	8.73	30	2.42	.44
Group C	Biography	8.66	30	2.27	.41
	Short Story	9.83	30	1.59	.29
	Biography	8.66	30	2.27	.41
	Textbook Article	8.50	30	2.82	.51
	Short Story	9.83	30	1.59	.29
	Textbook Article	8.50	30	2.82	.51
Group D	Biography	8.03	29	1.61	.29
	Short Story	8.93	29	1.66	.30
	Biography	8.03	29	1.61	.29
	Textbook Article	7.31	29	1.71	.31
	Short Story	8.93	29	1.66	.30
	Textbook Article	7.31	29	1.71	.31

M: Mean, SD: Standard Deviation, SEM: Standard Error Mean

When the Table 30 was further examined within group basis, it could be understood that the participants' scores in the reading comprehension test of the short story text were higher than those in biography and textbook article texts. To illustrate, the participants in group A got higher scores in the short story reading comprehension test (M=11.40, SD=1.69) than the biography reading comprehension test (M=10.40, SD=1.63) and textbook article reading comprehension test (M=10.03, SD=1.56). Likewise, the control group having no gloss got greater mean scores in short story test (M=8.93, SD=1.66) compared to biography

(M=8.03, SD=1.61) and textbook article tests (M=7.31, SD=1.71). The mean scores in each group showed the same increase in short story test. It seemed that the participants were more successful in understanding short story text in comparison to biography and textbook article texts. On the other hand, the mean scores in the textbook article reading comprehension test indicated that the participants in each group received lower scores compared to the mean scores in the biography and short story reading comprehension tests. For instance, the participants in group B who were assigned to the combination of textual and pictorial gloss had the lowest mean scores in textbook article reading comprehension test (M=8.73, SD=2.42) between biography reading comprehension test (M=9.10, SD=2.39) and short story reading comprehension test (M=9.93, SD=1.57). In the same vein, for group C receiving textual gloss only, the lowest scores were obtained in the textbook article reading comprehension test (M=8.50, SD=2.82) whereas the highest scores were achieved in the short story reading comprehension test (M=9.83, SD=1.59). Therefore, it could be clearly inferred from the results that the participants in all four groups were less successful in understanding the textbook article in comparison to their success in comprehending the short story and biography texts.

In general, there were differences in the participants' mean scores in each reading comprehension test. The participants had higher comprehension scores in short story test whereas they had lower performances in textbook article tests. Further analysis was carried out for the purpose of understanding whether these differences in reading comprehension tests in terms of text type was meaningful or not. The results of the paired samples t-test analysis were presented in Table 31.

According to the Table 31, in group A there were statistically meaningful differences between biography and short story reading comprehension tests; t(29)=-2.15, p=.040, and also between short story and textbook article; t(29)=3.60, p=.001 (two-tailed). For group A receiving the combination of textual, pictorial and audio gloss, text type seemed to have a significant effect since the participants were more successful in understanding the short story text which belongs to narrative text genre, compared to the biography and textbook article texts which were expository texts.

Dependent-samples t-test result in group B indicated that the only significant difference was found between short story and textbook article; t(29)=2.56, p=.016. Compared to the results of the group A, there was no statistically significant difference between biography and short story; t(29)=-1.65, p=.108. However, in group C a similar result as in group A was found between biography and short story; t(29)=-2.57, p=.015, and between

short story and textbook article; t(29)=2.18, p=.037. Likewise, in control group, the differences between the biography and short story t(28)=-2.21, p=.035, and between the short story and textbook article were found to be meaningful. As a result, these results suggested that there seemed to be an effect of text type on reading comprehension of the L2 learners. The short story appeared to be comprehended significantly more than the textbook article for all groups and, than the biography for groups A, C and D. It might be inferred that the comprehension of a narrative text was easier than the comprehension of an expository text.

Table 31. *Paired Samples Test Results of Reading Comprehension Tests Scores Separately*

		Paired Differences					**t**	**df**	**p (2-tailed)**
		M	**SD**	**SEM**	**95% CI. of the Difference**				
					L	**U**			
Group A	Biography Short Story	-.93	2.37	.43	-1.82	-.04	-.2.15	29	.040
	Biography Text. Article	.43	1.94	.35	-.29	1.15	1.22	29	.231
	Short Story Text. Article	1.36	2.07	.37	.59	2.14	3.60	29	.001
Group B	Biography Short Story	-.83	2.75	.50	-1.86	.19	-1.65	29	.108
	Biography Text. Article	.36	2.45	.44	-.55	1.28	.81	29	.420
	Short Story Text. Article	1.20	2.56	.46	.24	2.15	2.56	29	.016
Group C	Biography Short Story	-1.16	2.47	.45	-2.09	-.24	-2.57	29	.015
	Biography Text. Article	.16	2.82	.51	-.88	1.22	.32	29	.749
	Short Story Text. Article	1.33	3.33	.60	.08	2.57	2.18	29	.037
Group D	Biography Short Story	-.89	2.17	.40	-1.72	-.06	-2.21	28	.035
	Biography Text. Article	.72	2.03	.37	-.04	1.49	1.91	28	.065
	Short Story Text. Article	1.62	1.97	.36	.87	2.37	4.42	28	.000

Effects of the text types on word retention.

The third research question enquiring whether exposure to different text types makes a significant difference on L2 learners' retention of target words was analyzed in this section. As the groups were administered vocabulary tests under different glossing conditions, between groups analysis was not applied. Instead, this analysis was carried out within group paired samples t-test. Each group's scores in one of the delayed vocabulary test were compared to that group's scores in another delayed vocabulary test related to the reading text.

Table 32. *Paired Samples Statistics of Delayed Vocabulary Test Scores Separately*

		M	**N**	**SD**	**SEM**
Group A	Biography	7.43	30	1.00	.18
	Short Story	7.90	30	1.09	.19
	Biography	7.43	30	1.00	.18
	Textbook Article	6.86	30	1.16	.21
	Short Story	7.90	30	1.09	.19
	Textbook Article	6.86	30	1.16	.21
Group B	Biography	6.86	29	1.35	.25
	Short Story	7.00	29	1.06	.19
	Biography	6.86	29	1.35	.25
	Textbook Article	6.17	29	1.39	.25
	Short Story	7.00	29	1.06	.19
	Textbook Article	6.17	29	1.39	.25
Group C	Biography	5.57	28	1.93	.36
	Short Story	6.46	28	1.81	.34
	Biography	5.57	28	1.93	.36
	Textbook Article	6.03	28	1.85	.35
	Short Story	6.46	28	1.81	.34
	Textbook Article	6.03	28	1.85	.35
Group D	Biography	2.71	28	1.43	.27
	Short Story	4.25	28	1.62	.30
	Biography	2.71	28	1.43	.27
	Textbook Article	3.46	28	1.40	.26
	Short Story	4.25	28	1.62	.30
	Textbook Article	3.46	28	1.40	.26

The comparative and descriptive statistics of each group's scores in each test were represented in Table 32. According to the results presented in the table, the participants' mean scores in each delayed vocabulary test reduced starting from group A to group B and from group B to group C and from group C to group D. This situation was valid for each test. For instance, when the mean scores in the delayed vocabulary test asking for the target words included in biography text for group A was 7.3 with 1.00 standard deviation, it was 6.86 with 1.35 standard deviation for group B. In addition, group C had higher mean scores in delayed vocabulary test related to the biography text (M=5.57, SD=1.93) than the control group (M=2.71, SD=1.43).

The differences were also found within group results. Regarding the mean scores received in short story vocabulary test, it could be figured out that the participants in each group regardless of the glossing treatment had higher scores compared to the scores they got in biography and textbook article vocabulary tests. As for the comparison between biography and textbook article vocabulary test scores, only the participants in group C had higher textbook article vocabulary scores (M=6.03, SD=1.85) than biography scores (M=5.57, SD=1.93). For the other groups, the biography scores were greater than the textbook article scores. On the other hand, the comparison between the scores received in the short story and textbook article vocabulary tests indicated that the participants in all four groups performed better in short story vocabulary test than they did in textbook article vocabulary test.

The results of the paired samples t-test which was conducted to investigate whether the differences in the delayed vocabulary tests per text were statistically significant were demonstrated in Table 33. In group A, significant differences were found between all delayed vocabulary test results. There was an increase in the performance of the participants from the biography vocabulary test (M=7.43, SD=1.00) to the short story vocabulary test (M=7.90, SD=1.09) with mean difference -.46, and 1.19 standard deviation; t(29)=-2.13, p=.041. Besides, the scores in short story (M=7.90, SD=1.09) were significantly higher than the textbook article scores (M=6.86, SD=1.169 meaning that there was a decrease in the performances of the participants in group A from the short story test to the textbook article test (M=1.03, SD=1.12); t(29)=5.01, p=.000. In terms of the comparison between the biography and textbook article scores, there was a meaningful decrease (M=.56, SD=.89) from the performances in the biography to those in the textbook article; t(29)=3.45, p=.002.

In group B, the significant differences were found in the comparisons between biography and textbook article (M=.68, SD=1.53); t(28)=2.41, p=.023, and between short story and textbook article (M=.82, SD=1.22); t(28)=3.63, p=.001. However, in group C the

only significant difference was between biography and short story (M=-.89, SD=1.83); t(27)=-2.57, p=.016. As for group D, significant differences were found between the biography and short story vocabulary scores (M=-1.53, SD=1.66); t(27)=-4.87, p=.000, between biography and textbook article scores (M=-.75, SD=1.66); t(27)=-2.37, p=.025, and between short story and textbook article vocabulary test scores (M=.78, SD=1.97); t(27)=2.60, p=.015.

Table 33. *Paired Samples Test Results of Delayed Vocabulary Test Scores Separately*

		M	SD	SEM	95% CI. of the Difference		t	df	p
					L	U			
Group A	Biography Short Story	-.46	1.19	.21	-.91	-.02	-.2.13	29	.041
	Biography Text. Article	.56	.89	.16	.23	.90	3.45	29	.002
	Short Story Text. Article	1.03	1.12	.20	.61	1.45	5.01	29	.000
Group B	Biography Short Story	-.13	1.09	.20	-.55	.27	-.68	28	.502
	Biography Text. Article	.68	1.53	.28	-.10	1.27	2.41	28	.023
	Short Story Text. Article	.82	1.22	.22	.36	1.29	3.63	28	.001
Group C	Biography Short Story	-.89	1.83	.34	-1.60	-.18	-2.57	27	.016
	Biography Text. Article	-.46	2.15	.40	-1.29	.36	-1.14	27	.263
	Short Story Text. Article	.42	1.47	.27	.14	1.00	1.53	27	.136
Group D	Biography Short Story	-1.53	1.66	.31	-2.18	-.88	-4.87	27	.000
	Biography Text. Article	-.75	1.66	.31	-1.39	-.10	-2.37	27	.025
	Short Story Text. Article	.78	1.97	.30	.16	1.40	2.60	27	.015

Regarding all the findings from t-test analysis, there was no common result for all four groups. The within group analysis indicated various significant differences between delayed vocabulary tests; however, when these differences were taken into consideration between groups, none of the differences between one kind of delayed vocabulary test to the other one was found to be valid for all groups. Therefore, it might be said that there were no significant differences between groups in terms of the effect of the text type on word retention. Instead, the significant differences between tests within group analysis might be caused by glossing type, not by text type.

Effects of Mediated Glosses on L2 Learner's Attitudes

To examine the participants' attitudes towards online glosses and answer the research question 4, the data from the attitude questionnaire were first analyzed descriptively. Since the control group (D) did not get exposed to any kind of online glosses, the attitude questionnaire was not administered to them. That is why, only the scores of the experimental groups (A, B and C) were taken into consideration in the analysis. The results of the analysis were presented in Table 34. In the questionnaire the participants were asked to rate eight attitude statements in 5-point Likert scale (1: Strongly Agree, 2: Agree, 3: Neutral, 4: Disagree, 5: Strongly Disagree)

Table 34. *Descriptive Statistics for Attitude Questionnaire Scores in Total*

	N	M	SD	SE	95% CI for Mean		Min.	Max.
					LB	UB		
A	30	2.05	.45	.08	1.88	2.22	1.10	3.00
B	30	2.15	.56	.10	1.94	2.36	1.00	3.50
C	30	2.20	.58	.10	1.98	2.41	1.00	3.10
Total	90	2.13	.53	.05	2.02	2.24	1.00	3.50

The table above indicated that regarding total mean scores obtained from the attitude questionnaires, all three of the experimental groups: A, B and C had positive attitudes towards online glosses since the mean scores of this questionnaire were almost 2 which meant they rated most of the statements as "Agree". Within the experimental groups, the mean scores of the group A (M=2.05, SD=0.45) was slightly lower than group B (M=2.15, SD=0.56) and C (M=2.20, SD=0.58), which both had similar mean scores meaning that among the experimental groups, group A seemed to have more positive attitudes towards online glosses. In general, their mean scores appeared to be very close to each other. In order to understand whether the groups differed from each other significantly, one-way ANOVA was conducted, and the results of this analysis were illustrated in Table 36 after the assumption of homogeneity of variance was checked in Table 35.

Table 35. *Test of Homogeneity of Variances of Attitude Questionnaire Scores*

Levene Statistic	df1	df2	p
1.035	2	87	.359

Table 36. *ANOVA Results for Attitude Questionnaire*

	SS	**df**	**MS**	**f**	**p**
Between Groups	.33	2	.168	.588	.558
Within Groups	24.92	87	.287		
Total	25.26	89			

SS: Sum of Squares, MS: Mean Squares

The testing of the homogeneity of variance through Levene Statistics revealed that the attitude questionnaire scores were distributed homogenously among the groups since the p value of this test was greater than .05 (p=.359). The ANOVA results in the Table 36 demonstrated that the differences between groups were statistically insignificant: f(2, 89)=.588, p=.558. This analysis indicated that the groups were not statistically different regarding their scores in the attitude questionnaire. The participants were likely to have similar attitudes towards any kind of glossing. The kind of glossing whether it was pictorial, audio and textual or the combination of them appeared to have no significant effect on L2 learners' attitudes towards online glosses. It could be inferred that the L2 learners developed positive attitudes towards online glosses when they got exposed to any kind of glossing strategy.

Until here, the data from the attitude questionnaire were analyzed over total attitude scores on group basis, and no significant difference was found between the experimental groups. However, a detailed analysis was needed to be carried out on item basis to determine whether the experimental groups (A, B and C) had significant differences on their responses for each attitude statement out of 8 attitudes measured in the questionnaire. To this end, one-way ANOVA analysis was run for each attitude statement to determine if there were significant differences between the group A, B and C in their responses to each attitude item. The results of this analysis were summarized first in Table 37 descriptively and then in Table 38 for significance values.

According to the Table 37, the most positively rated attitude statement was "The online glosses helped me learn the new words" by all of the experimental groups. The most positive response was given by group A which took the combination of textual, pictorial and audio gloss (M=1.43, SD=.50), and secondly by group C taking textual gloss (M=1.53, SD=.62) and then group B which was assigned to textual and pictorial gloss (M=1.56, SD=.56). After this statement, the second most positive response was given to "The online glosses helped me understand the texts" (M=1.53, M=1.66, M=1.86 for groups A, B and C

respectively). As a result, the responses to these two statements indicated that the participants in any kind of glossing strongly agreed on the usefulness of online glosses for vocabulary learning and reading comprehension.

Table 37. *Descriptive Statistics for Attitude Questionnaire*

		M	SD	SE
1. The online glosses helped me learn the new words	Group A	1.43	.50	.09
	Group B	1.56	.56	.10
	Group C	1.53	.62	.11
2. The online glosses helped me understand the texts	Group A	1.53	.57	.10
	Group B	1.66	.60	.11
	Group C	1.86	.68	.14
3. The online glosses were clear and understandable	Group A	1.60	.72	.13
	Group B	1.90	.80	.14
	Group C	1.76	.72	.13
4. I liked reading the texts	Group A	2.03	.71	.13
	Group B	1.96	.80	.14
	Group C	2.13	.93	.17
5. The online glosses distracted me from reading the texts	Group A	2.03	.65	.11
	Group B	2.00	.83	.15
	Group C	2.03	.71	.13
6. Online glosses are better than paper-based dictionaries	Group A	2.16	1.23	.22
	Group B	2.23	1.00	.18
	Group C	2.66	1.15	.21
7. Online texts are better than paper-based texts	Group A	2.73	1.33	.24
	Group B	2.83	1.20	.22
	Group C	2.83	1.11	.20
8. I would read more books for pleasure if they used online glosses	Group A	2.50	1.22	.22
	Group B	2.93	.94	.17
	Group C	2.66	1.09	.19

On the other hand, the least positive response out of this eight attitudes were given to the statement "Online texts are better than paper-based texts" (M=2.80 in total) by the participants in the experimental groups. This result was not surprising because the both online texts and paper-based texts were similar in their message transfer. The second least positive rated attitude was "I would read more books for pleasure if they used online glosses" (M=2.70 in total). Yet, the groups rated these statements different from each other. For instance, the

participants who were assigned to textual+ pictorial gloss had mean score 2.93 whereas the participants who were assigned to the combination of textual, pictorial and audio group had the mean score of 2.50 for the second least positively rated statement. Further analysis was conducted to figure out if the differences among groups on their responses for each statement were significant. The analysis in the Table 38 showed that there was no significant difference among groups in terms of their ratings for each attitude statement because all p values of this analysis were greater than .05. It might be said all three kinds of glosses used in this study had the same positive effect on the L2 learners' attitudes towards online glosses.

Table 38. *ANOVA Results for Attitude Questionnaire*

	df	**f**	**p**
The online glosses helped me learn the new words	2	.44	.642
The online glosses helped me understand the texts	2	1.85	.163
The online glosses were clear and understandable	2	1.19	.307
I liked reading the texts	2	.30	.735
The online glosses distracted me from reading this passage	2	1.49	.230
Online glosses are better than paper-based dictionaries	2	1.71	.186
Online texts are better than paper-based texts	2	.067	.935
I would read more books for pleasure if they used online glosses	2	1.19	.307

Findings from the Feedback Questionnaire and Interviews

In this section, the findings from the analyses of feedback questionnaire and semi-structured interviews are presented. The aim of conducting interviews and collecting data through the questionnaire was to understand the opinions, experiences and perceptions of the participants about the experimental part of the study, which was the research question 5. From a qualitative perspective, the results of the questionnaire were presented and followed by the findings from the semi-structured interviews.

After the participants completed the experimental part of the study by reading the texts and taking the tests, they were administered the feedback questionnaire consisting of 15 close and open-ended questions. Thus, the data from feedback questionnaire were collected from all of the participants (N=119). The results of the questionnaire were presented in tables with frequencies of the responses. On the other hand, three participants from each group were interviewed to figure out their perceptions and opinions about the treatment, the usefulness of glosses and the reading materials. Most of the questions were asked to clarify, support and complement the findings from the feedback questionnaire. The interviews were carried out in

three weeks after the participants completed the experimental part of the study. The interviewees were coded according to their group as A1, A2, A3 (textual+ pictorial+ audio gloss), B1, B2, B3 (textual+ pictorial), C1, C2, C3 (textual) and D1, D2, D3 (control). The findings from the interviews were explained with several excerpts from the participants' interviews and presented after the related findings from the questionnaire because the findings from the questionnaire were consistent with the findings from the interviews. The researcher avoided repetition by presenting the findings from the both instruments together to answer the fifth research question.

Table 39. *Frequency of Participants' Responses to Feedback Questionnaire (Q1, Q2 and Q3)*

	Interesting (Q1)		**Like most (Q2)**	**Appropriate level (Q3)**	
	Yes	No		Yes	No
Text1 (biography)	85	34	34	107	12
Text2 (short story)	74	45	65	115	4
Text3 (text. article)	69	50	20	97	22

In the questionnaire the first 4 questions were about the reading texts in general, whether the participants found them interesting (Q1), or suitable to their proficiency level (Q3), whether they liked reading them (Q2) or which one they found the most difficult (Q4). As it could be seen in Table 39 for the first question, 85 of 119 participants found the biography text interesting while 34 participants did not find it interesting. For the second reading text, 62% of the participants (N=74) found it interesting while the remaining 38% did not find the short story interesting. As for the last reading text, 58% of the participants (N=69) found its topic interesting whereas 42% (N=50) of the participants did not find it interesting. Among all three of the reading texts, the biography one was found to be the most interesting. When the participants' responses to the second question in the questionnaire were taken into consideration, it could be understood that they liked the short story most since 54% of the participants (N=65) liked it most. Even if the participants did not find the topic of the short story the most interesting, they liked reading it most. The number of the participants who liked reading the textbook article most was 20, which corresponded to 16.8% of the participants. With respect to Q3 asking whether the participants found the texts suitable to their proficiency level, the vast majority of the participants gave positive response to this question. Especially for the short story, except 4 learners, all of the participants thought that it was appropriate to their level. The situation was similar for the first text. On the other hand, 18% of the participants (N=22) did not find the textbook article suitable to their level, the

reason of which could be understood from the answers given to the question four. The fourth question was an open-ended question and asked the participants which reading text they found difficult and why. 46% of the learners found textbook article the most difficult one among the other texts because most of them thought that there were more unknown words in that reading material compared to the biography and short story, and found reading it boring. On the other hand, 32% of the participants found the biography text difficult and the reason why they thought it was that they found the vocabulary difficult or they did not like reading biographies, or there were many dates in the text. 17% of the participants found the short story text as the most difficult one. The most common reasons presented were the number of unknown words and complicated plot.

Table 40. *Interview Results of Participants' Opinions about the Reading Texts*

Opinions about the reading texts		
Positive opinions	Interesting topic	A1, B1, B3, D2, D3, C3
	Simple language use	A2, A3, B2, D1
	Various text types	B2, D1
	Informative	C3
Negative opinions	Boring topic	A3, B1
	Unknown words	D3

When the interviewees were asked their opinions about the reading materials, there were positive and negative opinions depending on each text. Except three interviewees, all of them responded positively for all three texts as can be seen in Table 40. The positive responses of the interviewees stemmed from the fact that they found at least one of the texts interesting (A1, B1, B3, D2, D3, C3), informative (C3). Besides they liked reading at least one of them due to its genre (B2, D1) or simple language use (A2, A3, B2, D1). To illustrate, the participant D3 stated:

> I think the texts were good. Normally, I don't like reading biographies, I had thought so, but when I read Martin Luther King text, I realized that I enjoyed reading it at that moment (laughing). So I think the choice of the texts was good, and they had different and interesting contents.

The reason why the three interviewees did not like reading all three texts was that they found the topic of one of the texts uninteresting (A3, B1), or one of the texts included more unknown vocabulary (D3). As for their opinions about which one they liked most and its reason, the seven of the interviewees favored the short story text because of the nature of the story and its topic. One of the participants (A3) responded:

> I only liked reading Cat in the Rain text since it was descriptive and it could be read by imagining. For instance, the first text was biography and I could not picture it in my head. Its topic was also boring. That is why, it was like just straight reading… But, in the story the language of daily life was being used. Of course, there were some exceptional words such as padrone. A special name had been given to the owner of the hotel. Yet, because the Cat in the Rain text was closer to daily life, it was better than the others. I mean its language was simpler.

On the other hand, four interviewees liked reading the biography text since they found its topic interesting. For instance, one of them (B1) reported:

> I liked reading Martin Luther King text very much. I liked its topic. I mean how he saved human rights. I want every person or race to have their freedom. But I did not like Cat in the Rain. Its topic was not interesting for me.

However, for the article text, only one participant liked it most due to its topic (C3). It seemed from these findings that interviewees had various positive and negative opinions for each reading text. They liked the short story (narrative) more compared to the biography and article (expository) because they found its language more readable, whereas the other biggest reason for liking the other texts was the topic of that text. However, in general the interviewees had more positive opinions about the reading texts.

The questions 5, 6 and 7 in the questionnaire further asked about the difficulty of the texts separately in terms of vocabulary, grammar, content and language use. The participants were expected to rate each dimension on a 5-point Likert scale from 1 being 'very easy', 2 'easy', 3 'moderate', 4 'difficult' to 5 'very difficult'. The results of these three questions were demonstrated in Table 41, 42 and 43 respectively. The first reading text was mostly rated as 'moderate' regarding the difficulty in terms of vocabulary (N=63), content (N=55) and language use (N=52) by the participants. With respect to grammar difficulty, half of the participants rated it as 'easy'. In terms of vocabulary difficulty, 26 participants also rated the biography text as 'difficult' whereas 24 participants rated it as 'easy'. However, when the majority of the participants were considered, the first text leaned on being 'moderately' difficult.

Table 41. *Frequency of Responses to Feedback Questionnaire (Q5)*

		Vocabulary	**Grammar**	**Content**	**Language use**
Text 1	Very Easy	4	13	8	11
	Easy	24	62	40	44
	Moderate	63	38	55	52
	Difficult	26	6	14	12
	Very Difficult	2	0	2	0

On the other hand, the second reading text was mostly rated as 'easy' in terms of grammar difficulty (N=60). Yet, according to 42 participants, the grammar difficulty level of the second text was moderate. Considering vocabulary difficulty, most of the participants found the short story as 'moderate' (N=70), and 36 participants rated it as 'easy'. In respect to content, 'easy' or 'moderate' levels were preferred by 73% of the participants (N=43, N=44). A similar rating was gained for language use difficulty. A total of 97 participants rated language use as 'easy' or 'moderate'. In general, the responses to the difficulty of short story text indicated tendency from 'easy' to 'moderate.

Table 42. *Frequency of Responses to Feedback Questionnaire (Q6)*

		Vocabulary	**Grammar**	**Content**	**Language use**
Text 2	Very Easy	4	13	19	11
	Easy	36	60	43	47
	Moderate	70	42	44	50
	Difficult	7	4	11	11
	Very Difficult	2	0	2	0

Table 43. *Frequency of Responses to Feedback Questionnaire (Q7)*

		Vocabulary	**Grammar**	**Content**	**Language use**
Text 3	Very Easy	2	8	4	7
	Easy	19	37	30	32
	Moderate	47	56	51	53
	Difficult	45	17	28	25
	Very Difficult	6	1	6	2

The results of the question 7 demonstrated that the frequency of responses generally distributed between easy, moderate and difficult, and centered on 'moderate' level. The participants mostly rated the vocabulary difficulty of the third text as 'moderate' or 'difficult' (N=47, N=45). However, there were also 19 participants thinking that the vocabulary of the textbook article was easy. In terms of grammar difficulty, 47% of the participants (N=56) found the third text 'moderate' whereas 31% (N=37) rated it as 'easy' and 14% (N=17) as 'difficult'. For content difficulty, 51 participants found the text at moderate level whereas 30 participants rated 'easy', and 28 participants responded as 'difficult'. When language use was considered, it could be seen that a similar tendency with content difficulty existed in language use. 53 participants rated it as 'moderate', 32 participants rated as 'easy' while 25 participants thought that the textbook article was difficult regarding language use. Consequently, the participants mostly rated the difficulty of textbook article in terms of four dimensions (vocabulary, grammar, content, language use) as 'moderate'. Only in terms of vocabulary, the responses inclined from 'moderate' towards 'difficult'.

To conclude, the difficulty levels of each reading material indicated that the participants mostly rated them as moderately difficult. However, the second text which was a short story seemed to be found slightly easier than the third reading text in terms of vocabulary and grammar difficulty. It could be inferred from these results that the participants found the difficulty of the texts appropriate to their proficiency levels in general.

There were supporting results from the interviews about the difficulty of the texts. When the interviewees were asked whether they had difficulty in understanding the texts, only three participants from the control group (D1, D2, D3) responded that they could not understand the content of the texts thoroughly, which was not surprising since they did not have access to any kind of gloss. For example, the participant D3 expressed:

> Actually I tried to understand the texts. I think I understood the first text, some parts of the second text. I understood what they told in general. But there were some words I did not know their meanings. So, I could not understand the third text for example. Maybe there were more words that I didn't know in it.

However, the participants from the experimental groups that were exposed to mediated glosses reported that they did not have difficulty in understanding the texts and answering the tests as stated by one of them (B2):

> The texts were not different from each other. I mean the difficulty. I could understand them. The vocabulary was easy. Their meanings had been given. There were Turkish definitions. They were explained with the text. Especially, the explanations with pictures were good. I think they were easier to remember… The questions can also be solved easily after you read and understand the texts.

Table 44. *Frequency of Responses to Feedback Questionnaire (Q8 and Q9)*

	Q8: Favourite text types			**Q9: How frequently you read?**				
	1-most	**2**	**3-least**	**Never**	**Rarely**	**Somet.**	**Often**	**V.Often**
Biography	16	69	34	11	42	47	15	4
Short Story	96	17	6	1	20	24	58	16
TextArticle	7	33	79	8	40	52	16	3

The questions 8 and 9 in the questionnaire were about the types of reading texts used in the study. In question 8, the participants were asked to rank three types of texts whether they liked reading them as 1 being 'the most I like' and 3 'the least I like' in their everyday life. Likewise, the question 9 asked the participants to rate how frequently they read the same types of texts on a 5-point Likert scale (1: Never, 2: Rarely, 3: Sometimes, 4: Often, 5: Very Often). The results of both questions were presented in Table 44. According to the results of the question 8, the majority of the participants (N=96) liked reading short stories most, and

biographical texts followed it with 69 participants' ranking. On the other hand, a number of participants (N=79) liked reading textbook articles the least. With regard to the question 9, the results indicated that the frequency of reading biography was responded by most of the participants as either 'rarely' (N=42) or 'sometimes' (N=47). However, the results demonstrated that short stories were 'often' read by 58 participants although 20 and 24 participants read them 'rarely' and 'sometimes' respectively. However, the results of the responses given for textbook article revealed that a great number of the participants (N=92) reported that they read textbook article types of texts 'rarely' or 'sometimes'. In conclusion, the short story types of texts (narrative) were found to be read more often than biographies and articles (expository) by the participants.

Table 45. *Interview Results of Participants' Opinions and Preferences Regarding Text Types*

Reading Preferences for certain text types and reasons				
	Positive reasons		**Negative reasons**	
Short Story	Narration	D2,A3,C1,C2, C3	Many characters	A1
	Everyday lang.	A2, A4	Unreal events	B1
	Frequent encounter	D2, D3		
	Fictional	B2, B3		
	Entertaining	A4		
Biography	Topic interest	B2, C2, D2,	Boring	C1,D3,A3,D1
	Informative	A3, B1	Complex Chronology	A4
	Learning lesson	C3	Difficult vocabulary	A2
Article	Topic interest	B1, A1, D2	Hard to understand	A2,D3,B2,B3
	Informative	B1	Boring	D3,A2, D1
			Too Informative	A3, C2, C3

A similar finding was gained at the end of the interviews. When the interviewees were asked about whether they liked reading biography, story and textbook articles in their everyday life, most of the interviewees responded positively for short story (N=10), and biography (N=6). For non-scholarly articles, 3 interviewees responded positively as shown in Table 45. The most mentioned reason for favoring stories over biographies and articles was the language of narration used in stories as exemplified by one of the interviewees (D2):

> I like reading English stories. I even had sets of English stories and read them. When I read a story, I can picture it in my mind easily. As if a kind of screen appears, and I can imagine everything there. There are dialogues, a series of events and characters in stories. I think I understand stories when I feel the

events and think that I am there. As if nobody sees me there, but I feel I am there.

For biographies, the main reason why the participants preferred reading them was their topics. They prefer reading them when they were interested in the lives of the people whose biographies were told. One of the participants (A3) explained:

> I like reading biographies only when I am interested in that person. For example, I am not interested in politics and that is why, I don't want to read about a politician or president. Also if someone likes music, that person can like reading the biography of a singer. So I think it depends on the topic.

Likewise, as for textbook article type, the participants preferred reading them if they found their topics interesting (A1, B1, D2). The least preferred text type was textbook articles. The interviewees mentioned about the reasons why they did not prefer reading textbook articles. According to the findings from the interviews, the participants found the articles boring (A2, D1, D3), too informative (A2, C2, C3) and hard to understand because of their language (A2, B2, B3, D3). As an example, the participant D3 expressed:

> I don't like reading the articles very much in fact, but in the end I have to. I think I am getting bored when I read articles. I don't know. I guess they are boring because of their language. I don't understand them most of the time.

Another participant (A2) indicated:

> The topic is important for me. But in general, I see more words that I do not know their meanings in the articles, because they include specific terms and scientific words. When I do not understand the content because of those words, I get bored and do not want to read the article. I like reading stories. I think they are easier to understand.

However, one of the participants who liked reading non-scholarly articles (B1) stated:

> I generally read article types of texts in my life. I read news and magazine articles on the internet. I often read news from foreign websites like BBC since they are informative and based on the reality and real knowledge. I find reality more interesting.

It is obvious from these excerpts that the preferences and opinions of the participants differed from each other, but it could also be inferred that most of the participants appeared to prefer reading stories (narrative) more than biographies and articles (expository) and they preferred reading biographies more than articles. Besides, the topic of the reading material seemed to be an important factor for learners' preference of reading certain text types.

The questions 10, 11, 12, and 13 from the questionnaire were about to get general information about the implementation. With the question 10, the participants were enquired whether they had enough time for reading the texts and answering the tests. Except 5 participants all of the other participants (N=114) responded positively. The question 11 asked

how they would rate the website on a 5-point Likert scale (ranging from 'poor' to 'excellent'). 87 participants rated the website as 'good' or 'excellent' whereas 29 participants rated as 'average'. Likewise, in the question 12 the participants were asked how easy they found navigation in the website. They responded to this question by rating on a 5-point Likert scale with 1: very easy, 2: easy, 3: moderate, 4: difficult, 5: very difficult. The results indicated that no participant rated this question as difficult or very difficult, meaning that they did not have difficulty in using the website and therefore, the website was user-friendly. 106 participants gave response as 'easy' or 'moderate' for the difficulty level of navigation through the website. Likewise, in the interview, the participants were asked to tell what kind of difficulties or problems they had regarding the website. All of the interviewees responded that they did not face any difficulty or problem about the website. For instance, one participant (B1) gave a clear response:

> It was quite easy to use the website. It had a simple interface. There were written texts. There were also bold written words in the texts. When we clicked them, online glosses appeared. Then we closed them. We were scrolling down and at the end there was a 'go to questions' part. We were choosing the answers and moving on. We also had the chance to return to the questions we left unanswered. Yes, it had a very practical inter-face.

Another participant gave a more direct response: "Absolutely, using the website was very easy. I mean if you bring anyone who can read and write, he can get used to it easily".

As for the question 13, online reading was compared to paper-based reading on 5-point Likert scale (from 'much better' to 'much worse'). The participants' responses indicated that the tendency was on 'average' (N=52) and 'better' (41). There were 14 participants finding online reading worse than paper-based reading whereas there were also 12 participants finding it much better. The participants seemed to have positive or neutral opinions about online reading compared to paper-based reading in general. On the other hand, the interview results indicated that normally, some of the participants did not prefer online reading because they thought that they cannot focus (A1, C1), they cannot underline online texts (D1), online reading strains the eyes (A1, B3, C1) and it causes headaches (D2). However, among the five participants who did not like online reading in general, four of them responded that even if they didn't prefer online reading in their lives, they liked it in the study as reported by the participant C1:

> Normally I don't like reading something from the computer screen. I like it when they are in my hand and written because it does not only strain the eyes, but also I cannot concentrate on reading. When I saw this one, first I had thought that it was an unnecessary application. But after I looked at the texts and read them, I liked them. They were academic and advanced level. I could learn new words. I think they will contribute to our knowledge. So I really enjoyed it.

On the other hand, the questions 14 and 15 in the questionnaire were asked to understand how useful the participants found the glosses in comprehension of the texts and learning new vocabulary. These questions were answered depending on a 4-point Likert scale ranging from 'not useful' to 'very useful'. As the control group did not have any access to glosses, they were not expected to answer these questions. All experimental groups (N=90) gave a response textual gloss features which were English definitions, Turkish translations, example sentences. As for the pictorial gloss, since only the groups A and B had that feature in their glosses, the data from 60 participants who were in group A and B were taken into consideration. For audio feature, only 30 participants' responses were included in the results because the number of the participants having that feature was 30. The findings of these questions were presented in Table 46. In question 14 investigating the usefulness of the mediated gloss features for the participants' comprehension of the texts, the participants mostly found all of the gloss features 'useful' or 'very useful'. Turkish translations got the most 'very useful' rating from the participants (N=55 out of 90). The number of participants giving 'not useful' and 'somewhat useful' for all 5 gloss features was very low, indicating that the participants benefitted from glosses in understanding the texts. When the findings of the question 15 were considered, a very similar tendency could be seen in the participants' responses. For learning the vocabulary, a great number of the participants found Turkish translations (N=85 out of 90), English definitions (N=78 out of 90), pictures (N=58 out of 60), audio definitions (N=25 out of 30) and example sentences (N=73 out of 90) as either 'useful' or 'very useful'. As a result, it is obvious that the participants in this study had positive opinions about the usefulness of the mediated glosses in general.

Table 46. *Frequency of Responses to Feedback Questionnaire (Q14 and Q15)*

	Q14: Reading Comprehension					**Q15: Vocabulary learning**			
	1	**2**	**3**	**4**	**N**	**1**	**2**	**3**	**4**
English Definitions	1	3	50	36	90	4	8	48	30
Example Sentences	1	10	48	31	90	2	15	38	35
Turkish Translations	1	4	30	55	90	1	4	31	54
Pictures	1	5	18	36	60	0	2	19	39
Audio Definitions	0	3	8	19	30	2	3	13	12

1: Not at all Useful, 2: Somewhat Useful, 3: Useful, 4: Very Useful, N: Number of the participants

In the interview the participants' opinions about mediated glosses were also received. The responses of the interviewees indicated that all of the interviewees from experimental groups who got access to glosses found them useful. In addition to 'useful', mediated glosses were found to be sufficient to learn new vocabulary (A1, A2, B1, B3, C1, C2) practical (A3, C2), enjoyable (A3, A2, C1), easy to remember (A2, B2), time-saving (C1, C3), functional (A2, C1) and economic (C1) by the participants. There were also some participants who stated that they wished they could use multimedia glosses every day in their academic life (A2, B2, C2, C3). For instance, the participant C1 stated:

> I think it was a very successful application. It was both time-saving and economic. When I checked the meanings of the words, it did not consume my time. There was a Turkish translation, English definition and example sentence at the same time. So it was rich and good. At first, I was very prejudiced. I thought it would take my time. But when I looked at the website, I enjoyed it because of the glosses. I liked using technology in that way very much. I find it very useful and functional. I hadn't heard about glosses before. When I saw it, the existence of such application was interesting to me because I haven't seen it before. It was fun and interesting. I wish we could use that technology in education and in our lives every day.

Another participant (B3) also expressed his opinions about the glosses as:

> The most striking thing about this study was online glosses. Vocabulary had been explained with Turkish equivalents, English definitions, example sentences and pictures altogether. I hadn't seen anything like that for vocabulary before. Dictionaries do not have such explanations. We do not see these explanations for words on the internet. I think the best thing about this application was that all these explanations were provided simultaneously. It is a very useful and good system to teach vocabulary especially for those who study using their computers.

Table 47. *Interview Results of Participants' Use of Gloss Features*

Preferences for using gloss features and reasons		
Gloss features	**Reasons for the use**	**Participants**
Turkish translation	Native language	A3, C3
	More understandable	C3
English definition	More useful for understanding	C1, C2
	Habit formation	C1, C2
Picture	Attention-getting	A2, B3
	More useful for understanding	B1
	Different form	B2, B3
Audio information	Learning style	A1

To further understand the preferences of the participants for gloss contents, the participants who were exposed to mediated glosses were also asked about which feature of the gloss content they used more while reading. As shown in Table 47 their responses were Turkish translation (A3, C3), English definition (C1, C2), picture (A2, B1, B2, B3) and audio information (A1). The interviewees had different reasons for using certain gloss contents more. For instance, the interviewee utilizing audio feature (A1) stated: "I first listened to the explanation and then I read the information in the glosses. I prefer sound because I understand more by listening". On the other hand, among the 6 participants getting access to pictures in their glosses, 4 of them reported that they utilized picture glosses more. As an example, the participant B3 expressed his preference as:

> I looked at the pictures first since they took my attention. They were different from the written information. I think pictures make the information more memorable. When I answered the vocabulary test, the first thing that I remembered was the pictures of those words.

The participant who used Turkish translations more than English definitions (C3) expressed his preference reason as:

> I looked at the Turkish translations because it was in my native language and easy to understand. But if some pictures had been given for those words, I could have learned them better. For example, there was a word 'bead' in the text. If there had been a picture illustrating that word, it would have been better for me. I could have been more successful in the vocabulary test since I am a visual learner.

On the other hand, one of the participants using English definitions more than Turkish translations (C1) stated:

> English definitions were more useful. Sometimes when you look at Turkish translations, they do not seem to interpret properly. Also our teachers tell us to check English definitions. Now it became a habit for me to use English definitions. …If there had been images for the vocabulary, it would have been good for my friends who have visual memories. But I cannot keep images in my mind, instead I prefer written things.

The participants had various reasons for their uses of certain gloss types. The further explanations about their preferences also revealed that their responses differed depending on their learning styles as could be understood from the excerpts presented above. All of the participants also expressed that they would have achieved more if they had got the glosses appropriate to their learning styles.

CHAPTER FIVE

Discussion & Conclusion

This chapter first discusses the results of the present research in the light of the existing research in literature and theoretical framework. The findings of the study are discussed in two sections: reading comprehension and vocabulary learning. The findings from the attitude questionnaire and tracking tool along with the findings of the qualitative analysis including semi-structure interview and feedback questionnaire results are also embedded in the discussion of the effectiveness of the mediated glosses on both reading comprehension and vocabulary learning aspects. Second, following the discussion of the findings of the current study, the conclusion part of the present dissertation is presented with the pedagogical implications and the limitations of the study as well as suggestions for further research.

Discussion

Glossing technique is a facilitative and significant technique used for promoting L2 reading comprehension and vocabulary acquisition. There is a growing body of literature proposing the effectiveness of glossing technique on the improvement of L2 learners' comprehension of reading materials and vocabulary learning. In line with this expanding literature, the present study aimed to explore the impacts of three different combinations of mediated glosses on the reading comprehension and vocabulary learning performances of foreign language learners. The findings of the study indicated that glosses irrespective of their type or mode had a positive effect on the participants' text comprehension, vocabulary learning and word retention in general. However, there were differences among the three combinations of mediated glosses regarding their effectiveness on L2 reading comprehension and vocabulary learning. Therefore, further discussion of the findings is provided in two different sub-sections; the effects of mediated glosses on L2 reading comprehension and vocabulary learning in the light of the relevant studies.

Reading comprehension.

In order to investigate the efficacy of different combinations of the multimedia glosses on L2 reading comprehension, the language learners read three different texts with 30 target words glossed with textual information or the combination of textual and pictorial information

or the combination of textual, pictorial and audio information under three experimental and one control group conditions. The language learners were assessed based on three reading comprehension tests including multiple-choice and true/false questions. The findings of the first research question indicated that the language learners having access to glosses outperformed those in the non-gloss group on reading comprehension tests. This finding implied that glossing strategy was helpful in enhancing the L2 learners' comprehension of the reading material in general, which correlated with the findings of the previous studies that found positive effects of glosses on L2 reading comprehension (Bowles, 2004; Chun, 2001; Chun & Plass, 1996a, 1996b; De Ridder, 2002; Jacob, DuFon & Hong, 1994; Lomicka 1998; Marzban, 2011; Mayer, 2005; Taylor, 2006; Türk & Erçetin, 2014; Tabatabei & Shams, 2011; Yanguas, 2009).

Although this study found positive effects of the glossing on L2 reading comprehension, there were differences between the combinations of the mediated glosses regarding their effectiveness on the advancement of L2 reading comprehension. These differences should be carefully interpreted. In this study, the textual only gloss group did not statistically differ from the control group with regard to their reading comprehension performances, meaning that textual glossing was not as an effective as textual + pictorial gloss and textual + pictorial + audio gloss for enhancement of L2 learners' comprehension of reading materials. There are also some studies finding no meaningful effect of gloss use on reading comprehension such as Akbulut (2007), Ariew and Erçetin (2004), Cheng and Good (2009), Gasigijtamrong (2013), Jacobs *et al*. (1994), Joyce (1997) and Zarei and Mahmoodzadeh (2014). An explanation for this result could be the proficiency levels of the participants. There is some evidence in literature indicating that advanced level learners do not utilize glosses as much as intermediate learners do (Ariew & Erçetin, 2004). Since they are more proficient in guessing the meaning of the target words, they rely less on word level information in order to understand a reading text. They use their top-down processing abilities more than intermediate level learners. In this study, it could be that since the proficiency levels of the participants were higher than intermediate or beginner level as most of them rated their reading skills in English as good and their level as upper-intermediate, the difference between the control group and single textual gloss group was found to be insignificant in terms of L2 reading comprehension scores.

On the other hand, in comparison to textual gloss group the combination groups were significantly more successful than the control group on the reading comprehension tests. The effectiveness of textual + pictorial and textual + pictorial +audio glossing over textual gloss

can be explained by the Paivio's Dual Coding Theory and Mayer's Cognitive Theory of Multimedia Learning. According to Paivio's Dual Coding Theory, if the information is processed through both verbal and visual channels, the recognition and recall of this information is enhanced. Also as suggested by Cognitive Theory of Multimedia Learning, the simultaneous representation of information both verbally and visually alleviates the load of working memory that has a limited capacity. In this study, it has been found that the participants exposed to more than one mode of gloss simultaneously had an advantage over those exposed to a single gloss mode. Since they reached the information both in verbal-auditory and visual mode, their comprehension of L2 reading texts was improved, which correlates with the theoretical framework of the present research.

Additionally, the findings of the study indicated that the most effective type of glossing among the three types of glossing used in this study was the combination of textual, pictorial and audio gloss on the participants' reading comprehension levels in L2. It seems that addition of extended audio information in the textual and pictorial gloss had a positive effect on the understanding of L2 reading materials because more information was presented using various modes of information processing channels (Mayer, 2001). There are also several studies finding the positive effects of audio glosses alone or combined with textual and pictorial glosses on reading comprehension of L2 learners (Marzban, 2011; Mayer & Moreno, 1998; Sadeghi & Ahmadi, 2012; Zoi, Belloui & Mikropoluous, 2011). On the other hand, this result contradicts with the findings of Ariew and Erçetin (2004) and Sakar and Erçetin (2005). In their studies they found the negative effects of audio and video glosses on comprehension. They concluded that the audio and video glosses distracted the learners and hindered text comprehension. On the contrary, in this study, the findings from the attitude questionnaire indicated that the participants in the audio gloss group had positive attitudes towards online glosses regarding reading comprehension. They mostly disagreed the attitude statement 'Online glosses distracted me from reading the texts', meaning that they did not find auditory information distractive at all. In addition, there were no significant differences between the groups in terms of their attitudes towards different types of glosses in relation to reading comprehension. The findings from the feedback questionnaire and interviews also supported the findings from the attitude questionnaire. The majority of the participants found audio definitions either useful or very useful for their understanding of the reading texts.

The findings from the attitude questionnaire in terms of reading comprehension showed positive inclinations. The participants mostly agreed on the effectiveness of online glosses in understanding the texts. They also liked reading the texts and thought that they

would read more books if they used online glosses. The findings from the attitude questionnaire correlates with findings of Al Ghafli's study (2011) in which the same questionnaire was utilized. In that study, no significant difference was also found among the experimental groups receiving different combinations of multimedia glosses. There are also studies revealing the positive effects of the glosses on L2 learners' attitudes (Al-Seghayer, 2001; Erçetin, 2003; Ramezanali, 2017; Sakar & Erçetin, 2005; Yeh and Wang, 2003). The findings from the feedback questionnaire and semi-structured interviews supported and complemented the findings of the attitude questionnaire. The participants regardless of the type of the gloss gave positive responses to the usefulness of mediated glosses on promoting the understanding of the texts. They found reading enjoyable with the inclusion of glosses into reading materials as found in the study of Ariew and Erçetin (2004).

Consequently, this study found positive impacts of mediated glosses on reading comprehension performances, perceptions of reading experiences and attitudes of the learners. The scores of the learners on the three reading comprehension tests indicated the effectiveness of mediated glosses. The attitude questionnaire scores demonstrated the positive attitudes of the participants towards reading the texts when incorporated with online glosses. Likewise, the findings from the feedback questionnaire and interviews provided evidence for the positive perceptions of the participants with regard to their reading experience.

As for the effect of text types on reading comprehension of L2 learners through glosses, which is a part of the research question 3, it was found that the participants performed better on the comprehension tests of short story than biography and textbook article in each group. There seemed to be an effect of text type on L2 reading comprehension of the participants. While the short story text belonged to narrative genre, biography and textbook article were in the form of expository texts. Thus, it could be inferred from the results of the comprehension tests, the narrative text appears to be comprehended more than expository texts. This finding correlates with other studies such as Abraham, (2008), Farvardin and Biria, (2011), Ko (2005), Paribakht and Wesche (1999). In a meta-analysis, Abraham Lee (2008) reviewed each study investigating the effects of the glosses on L2 reading comprehension and vocabulary learning found that the effect of text type was larger in narrative texts compared to expository texts which had a medium effect. In the same vein, Paribakht and Wesche (1999) suggested that informative text types like expository texts affected the reading comprehension performances of the participants since the motivation and guessing of the learners were greatly influenced from the genre of the reading material.

For each group analysis, the participants outperformed significantly in the comprehension test of the short story compared to the textbook article; however, the comparison of the short story comprehension versus the biography comprehension was not statistically significant in all four groups. The group receiving the combination of textual and pictorial gloss group did not significantly differ in their comprehension scores of the short story and biography. Therefore, the effect of text type should be considered carefully. This difference between groups could be attributed to the interest level of the topics. In the feedback questionnaire, it was found that among the three texts, the biography was found to be the most interesting text by 85 participants. The learners' response in the interview also indicated that the reason for liking the biography text was its topic as one of the learner stated "I liked reading Martin Luther King text very much. I liked its topic; I mean how he saved human rights. I want every person or race to have their freedom". The textbook article; on the other hand, was found to be the least interesting text depending on the responses of the learners in the questionnaire and interview.

Another confounding factor with the effect of the text types could be the difficulty level of the texts for the participants. In the questionnaire, all of the participants were asked whether they found the texts appropriate to their proficiency level. The participants' responses revealed that the vast majority of them gave positive responses. To further understand the difficulty of the texts in terms of vocabulary, grammar, content and language use, the learners were asked to rate each text on a 5-point Likert scale (very easy, easy, moderate, difficult, very difficult). The learners' responses demonstrated that although they found the texts moderately difficult and thus, appropriate to their level in general, the short story text seemed to be slightly easier in terms of grammar and vocabulary than the other texts. However, the vocabulary of the textbook article was found to be difficult. This could be a reason for the better comprehension of the short story text (narrative) than textbook article (expository). How learners perceive the difficulty level of the texts might be a reason influencing their comprehension as well as text genre effect as suggested by Paribakht and Wesche (1999), and Far (2016).

Another justification for the effect of text type on reading comprehension could be related to whether the participants preferred reading certain text types. The findings from the feedback questionnaire demonstrated that the participants mostly liked reading narrative texts like stories more than expository texts like biography and article in their everyday lives. Since the participants preferred reading stories more, they could be more motivated to read the second text (short story) and be more successful in the comprehension test. The interview

results confirmed this finding obtained through questionnaire because most of the interviewees preferred reading stories most in their everyday life in comparison to biographies and textbook articles. According to the interview results, they thought the language of stories was ‘simpler’; they could get involved in stories thanks to ‘narrative language’; they were ‘used to read’ more stories throughout their lives, and reading story was ‘entertaining’. Their positive perceptions and opinions about story type might be a contributing factor on their success of understanding the short story text. Additionally, the participants preferred reading biographical texts more than non-scholarly articles. They seemed to find article texts ‘boring’, ‘informative’ and ‘hard to understand’ as they mentioned in the interviews. Their perceptions and opinions about articles might have a negative influence on their reading process in the experiment. This could be an explanation for their low performance in the textbook article reading comprehension test.

In conclusion, it could be inferred that the narrative texts appear to respond better to glossing than expository texts in terms of reading comprehension. However, this finding could not be generalized since there was only one narrative text and two expository texts in this study. In addition, topic interest, the difficulty level of reading texts, learner preferences of certain text genres should be taken into consideration carefully and controlled for understanding the effects of text genre on reading comprehension of L2 learners through glosses clearly and with greater certainty.

Vocabulary learning.

Another objective of the current study was to explore the influence of different combinations of mediated glosses on the vocabulary learning and retention of the foreign language learners. For this purpose, the participants read three texts under three different combinations of gloss conditions. Assigned to four conditions (control, textual gloss, textual +pictorial gloss, textual+ pictorial+ audio gloss), the participants answered three vocabulary tests in the form of multiple-choice, each related to the target words included in the relevant reading text right after the study to understand how much vocabulary was learned and two weeks later again to assess the retention of the target words.

Considering the L2 vocabulary learning of the participants, the findings of the study demonstrated that all three mediated glosses were significantly effective on learning of L2 vocabulary. This means that the glossing technique irrespective of the type contributed to increased vocabulary in comparison to non-gloss situation. This finding is consistent with a number of the studies examining the effects of glosses on L2 vocabulary development (Abraham, 2007; Al-Seghayer, 2000; Al Ghafli, 2011; Akbulut, 2007; Cheng & Good, 2009;

Chun & Plass, 1996a, 1996b; Gasigijtamrong, 2013; Hong, 2010, Yeh & Wang 2003; Jacobs *et al*., 1994; Ko, 2012; Mirzaei, 2014; Nation, 2001; Paribakht & Wesche, 1996; Ramezanali, 2017; Tabatabei & Shams, 2011; Yanguas, 2009; Zarei & Mahmoodzadeh, 2014; Watanabe, 1997).

In terms of the positive impacts of glosses, the relevant literature has revealed that through glosses, L2 learners' attention is directed to new or unknown words and thus, learners get engaged with the meaning of the target words and process them actively in mind (Yoshii, 2009). When learners interact with different types of glosses and get information about the meanings of the unknown words, their conscious gets raised about these words. Thus, their awareness of the new words can result in better learning (Nation, 2001). This might be a reason for the significant positive effect of the glossing on vocabulary learning of the participants in this study. This finding is also in line with Schmitt's Noticing Hypothesis (1990) claiming that in order for learning to take place, noticing is essential. Through glosses target words became more noticeable for the participants in the process of incidental vocabulary learning in this study. As the words got noticed with the help of the glosses, they might have got extra attention of the participants. Therefore, an essential part of learning could have been realized through glosses.

Another explanation for the facilitative influence of glossing on learning new vocabulary in an L2 can be the fact that glossing hinders learners from guessing the meanings of the unknown words from the text and thus, learners' working memory are not occupied by the vocabulary processing (Hulstijn, 1992). Since in this study, the participants were exposed to different combinations of multimedia glosses to learn the meanings of the unknown words, the incorrect guessing or inferencing of the word meanings was prevented, the participants could spend more time on text comprehension, and their recognition of the target words was increased and facilitated through the glosses as it has also been justified by AbuSeileek (2007).

The findings from the participants' responses to the usefulness of glosses on their learning of the vocabulary indicated that the vast majority of the participants found glosses including textual, pictorial and audio features useful or very useful for their vocabulary learning. Besides, the attitude questionnaire results demonstrated the participants' positive attitudes toward the usefulness of online glosses for learning new vocabulary. This result correlates with the previous studies finding the glossing useful for vocabulary learning (Aust *et al*., 1993; Chen, 2002; Cheng & Good, 2009; Chun and Plass, 1996a; Davis, 1989; Gettys *et al*., 2001; Jacobs, 1994; Jacobs *et al*., 1994; Ko, 2005; Kost *et al*., 1999; Miyasako, 2002;

Watanabe, 1997). Likewise, the interview results indicated that the experimental groups had positive opinions about the impacts of glosses on their vocabulary gains. They found the mediated glosses 'useful', 'sufficient', 'time-saving', 'practical', enjoyable', 'easy to remember' and 'functional'. This qualitative finding of the study with regard to vocabulary learning is also consistent with the benefits of glossing as suggested by the previous studies. The literature has indicated that glossing is a time-saving technique for word recognition (Gettys *et al*., 2001; Nation, 2001; Yanguas, 2009). It improves the autonomy of learners (Nagata, 1999), makes reading authentic texts more enjoyable and easy to read (Erçetin, 2003; Nation, 2013; Sakar & Erçetin, 2005). In conclusion, both quantitative and qualitative findings of the current study indicated strong positive evidence for the effectiveness of the glossing technique on L2 learners' vocabulary learning and retention.

In comparison to non-gloss situation, the existing literature has proven the positive effects of glossing on vocabulary learning and retention in general. However, there is still an inconsistency regarding which types or combinations of multimedia glosses contribute more to the enhancement of L2 vocabulary learning. In this study examining the impacts of the glosses on vocabulary learning; the single textual gloss, the combination of textual and pictorial gloss, and the combination textual, pictorial and audio gloss were compared with each other. The findings of this comparison demonstrated that the combination of textual, pictorial and audio gloss group significantly outperformed the single textual gloss and the combination of textual and pictorial gloss, meaning that the inclusion of audio information into textual and pictorial gloss contributed to the development of vocabulary learning. This finding seems to contradict with the assumptions of Dual Coding Theory because the theory puts both audio and textual information into one code-verbal, and images to another code-visual. Therefore, in this study, the combination of textual, pictorial and audio gloss should have had the same effect with the combination of textual and pictorial group because in both glosses, the information was processed through dual channels, which were verbal and visual according to the theory. However, the inclusion of second verbal information with different modality (auditory) made a difference in this study. One justification for this result could be the learning styles of the participants. As Plass *et al*. (1998) and Kim and Kim (2012) suggested, in order to learn vocabulary effectively learners' styles and preferences need to be considered carefully since visual learners can experience a better learning process through images, pictures, illustrations, graphics than written or auditory information. Similarly, learners with high auditory perception skills can learn new vocabulary through audio glosses more. In this study, the preferences or learning styles of the participants in the combination of textual, pictorial and audio gloss group might be more suitable to process and benefit from

auditory feature. In addition, they had exposure to both auditory and visual information. Addressing more than one learning style could have resulted in addressing more participants in the group with various learning styles. On the contrary to Dual Coding Theory, audio information combined with textual and pictorial information did not result in overload of working memory and thus, distraction or redundancy. Instead, it was more effective on the participants' vocabulary learning performances. The interview findings also indicated that the participants' use or preference of gloss features seemed to differ according to their learning styles as one of the participants expressed "I first listened to the explanation and then I read the information in the glosses. I prefer sound because I understand more by listening". It appears that learning styles of the learners can be a factor affecting the impacts of the different combinations of the glosses on vocabulary learning.

Apart from perceptual learning styles, the proficiency level of the learners could be another factor affecting the effects of multimedia glosses on the advancement of vocabulary learning. In this study, no significant difference was found between the combination of textual and pictorial gloss group and the single textual gloss group, which is a surprising finding regarding the previous studies finding the superiority of dual glossing mode over single glossing mode (Al-Seghayer, 2001; Chun & Plass, 1996; Ramezanali, 2017; Türk & Erçetin, 2014). However, there are also some studies asserting that proficiency levels of the learners make a difference on the effectiveness of multimedia glosses (Lomicka, 1998; Chen & Good, 2009). The learners with high proficiency levels of language can benefit from all types of multimedia glosses more than the learners with low proficiency language abilities (BenSalem, 2006). A possible explanation might be the high cognitive load of these multimedia glosses that requires higher levels of language proficiency to process the information in these glosses (Plass *et.al*., 2003; Sweller, 1994). Since the participants of the study had higher proficiency levels than intermediate or beginner learners, they might have benefitted more from the combination of glosses like textual+ pictorial+ audio for the recognition of target words by connecting the target words in the glosses to their existing L2 vocabulary knowledge and could have managed the cognitive overload of these glosses on their behalf easily. Another justification for this could be the simultaneous representation of both verbal-auditory and visual information. According to one of the principles of multimedia learning, when visual and verbal data are presented simultaneously, cognitive overload is decreased and learning gets enhanced. Therefore, the superiority of textual + pictorial +audio glosses over single textual gloss can be explained with the Cognitive Theory of Multimedia Learning. However, the difference between the participants' performances in textual+ pictorial gloss condition and those in textual+ pictorial+ audio gloss condition might be caused by the participants'

preference for a kind of gloss. The textual+ pictorial group might have consulted more to textual glosses but not the pictures while reading.

The finding of the superiority of textual+ pictorial+ audio gloss over the other two mediated glosses could also be explained with the encounter frequency of the participants with the target words. Since in the combination group with audio recording, the participants were supposed to read the textual information about target words, then look at the associated pictures and listen to the definition of the words, they got exposed to more information about the same words, resulting in more encounters with the words. Although this situation seems to cause redundancy effect according to the Dual Coding Theory, the simultaneous representation of these information as suggested by Mayer (2001) and high language abilities of the participants might have compensated the cognitive overloading of working memory. Likewise, Türk and Erçetin (2014) asserted that getting exposure to textual glosses accompanied with audio recordings at the same time has a facilitative effect on vocabulary learning.

The findings from the delayed test which was administered two weeks later in order to examine word retention showed similar results as the immediate vocabulary test scores. The experimental groups significantly outperformed control group on the delayed test, meaning that glossing significantly contributed to the participants' retrieval of learned vocabulary. Yet, the differences between the experimental groups demonstrated that the combined multimedia gloss groups were equally effective on the participants' word retention since there was no significant difference between these gloss conditions; however, the combination of textual, pictorial and audio gloss group was significantly better in L2 word retention than single textual gloss group. This finding was not surprising considering the literature proposing that pictures are remembered better than words (Underwood, 1989). Also, the audio definitions seem to have a facilitative effect on the recall of the vocabulary. The same explanations could be presented as in the case of vocabulary learning, which are the participants' learning styles and preferences. On the other hand, there was a significant difference between the participants' vocabulary learning and word retention in all groups. All of the gloss conditions along with the control group showed decrease in their vocabulary test performances two weeks later, which is an understandable result considering the single exposure to the target words in the study. This finding is consistent with the findings of the relevant studies such as Yoshii and Flaitz (2002), Al Ghafli, (2011), Nagata (1999), Cheng and Good (2009), Ramezanali (2017). As Nagata (1999) pointed out "A one-day lesson is not sufficient to establish long term retention" (p. 476), the participants of this study could partially recall the

target words they had already learned from immediate to delayed vocabulary test during the two-week interval. The impact of the multimedia glosses did not last extensively in the long-term because of the inadequate exposure to the vocabulary and lack of vocabulary practices during the treatment or after the treatment.

One factor that could be affecting the results of the study in terms of vocabulary learning and word retention performances of the participants was the frequency of accessing the glosses. The findings from the tracking program revealed that the experimental groups did not significantly differ from each other on their clicking behavior and accessing the glosses, and there was not a significant relationship between the frequency of access to glosses and participant scores on immediate and delayed vocabulary tests. This finding indicates that the participants showed similar behaviors on their frequency of accessing the glosses. Therefore, it could be concluded that the frequency access did not confound with the findings of this study. No significant differences were also reported by Hulstijn (1992), Chun and Plass (1996a), De Ridder (2002) between the frequency of access to the glosses and vocabulary performances of the learners.

As for the effect of the glossed text types on word retention performances of the participants, the within group analysis indicated various significant differences between delayed vocabulary tests; however, when these differences were taken into consideration between groups, none of the differences between one kind of delayed vocabulary test to the other one was found to be valid for all groups. Thus, the generalization of the finding to all of the participants would have been erroneous. Thus, it might be said that there were no significant differences between groups in terms of the effect of the text type on word retention. Instead, the significant differences between tests within group analysis might be caused by glossing type, not by text type. In this study, neither narrative text was found to be more effective through glossing on vocabulary retention of the participants for all groups, nor were glossed expository texts more effective on word gain. No significant difference was found to be valid for all of the groups among the mediated glosses in favor of one text type over the other in terms of word retention. Yoshii (2006) found a similar result of no significant effect of text type between L1 and L2 glosses. The differences between the groups might be stemming from the glossing type, the difficulty of the texts, proficiency level of the participants or the type of target words included in the texts but not from the text type in particular.

Further findings from the interviews and questionnaires indicated that the participants could easily use the website, get access to glosses and answer the questions online

comfortably. Also they reported that they had enough time to read the texts and to answer the tests. These findings are important since the time allocated or the format of the implementation did not negatively affect the process of the data collection and implementation of the study. On the contrary, the multimedia glosses allowed them to self-regulate during reading process. They had autonomy over their learning while interacting with the text and glosses. Therefore, they found the multimedia glosses enjoyable. This finding confirms with Erçetin (2003) and, Sakar and Erçetin (2005)'s studies. Thus, it could be concluded that most of the participants had positive opinions about the glosses used in the study, reading texts and the procedure of implementation.

Conclusion

The current study explored the influence of three different combinations of mediated glosses on foreign language learners' reading comprehension and vocabulary learning with a mixed methods research. Based on the Dual Coding Theory and the Cognitive Theory of Multimedia Learning as a framework, the study examined the impacts of the single textual gloss, the combination of textual and pictorial glossing, and the combination of textual, pictorial and audio glossing on the enhancement of L2 reading comprehension, vocabulary learning as well as vocabulary retention of the participants. In line with the effects of the mediated glosses, the study further examined the influence of text type on the participant's understanding of reading materials along with their word retention. Additionally, the study also investigated the participants' attitudes towards online glosses and their opinions, perceptions and experiences about the treatment to get an in-depth understanding of the mediated glosses.

In the experimental part of the study, the participants were assigned to three experimental groups and one control group. They read three different texts including a narrative and two expository texts in a multimedia environment under different glossing conditions. The participants were assessed with three reading comprehension tests, immediate and delayed vocabulary tests. Their attitudes towards online glosses were evaluated with an Attitude Questionnaire developed by Al Ghafli (2011). A tracking tool incorporated into the website also provided information about the frequency access to glosses. The data collection procedure was completed in 9 sessions. The data were analyzed with descriptive statistics along with inferential statistics. Parametric tests such as ANOVA, t-tests and correlational analysis were consulted for the analysis of quantitative data.

As for the qualitative phase of the study investigating the opinions, perceptions and experiences of the participants about the reading materials, multimedia glosses and the

website, a questionnaire was administered to all participants' of the study and semi-structured interviews were carried out with twelve participants of the study. For the analysis, frequencies were provided for the findings of the feedback questionnaire, and content analysis was applied for interview findings.

The results of the current study indicated that glossing contributed to the enhancement of L2 learners' reading comprehension, vocabulary learning and word retention. Among the mediated glosses, the combination of textual, pictorial and audio glossing was found to be significantly more effective on the participants' reading comprehension than the combination of textual and pictorial glossing, and single textual glossing. It seems that integration of extended audio information in the textual and pictorial glossing had a positive effect on the understanding of L2 reading materials, since more information is presented using various modes of information processing channels (Mayer, 2001).

Regarding the influence of multimedia glosses on L2 vocabulary learning as assessed by the immediate vocabulary test in this study, the results showed significant effects of all three electronic glosses compared to control group. The combination of textual, pictorial and audio glossing was found to be statistically more effective than textual+ pictorial glossing and textual glossing on the participants' vocabulary learning. The findings from delayed vocabulary test; on the other hand, revealed the contribution of glossing on word retention even though there was a significant decrease in the participants' scores in two-week gap, meaning that the glossing was partially effective on word retention compared to vocabulary learning. Furthermore, no significant relationship was found between the frequency of access to glosses and the participants' immediate and delayed vocabulary scores because the groups had similar clicking behaviors.

In respect of text type effects on reading comprehension and word retention scores of the participants, narrative text seemed to respond better to glossing than expository text in terms of reading comprehension. The narrative glossed text was understood more than glossed expository texts in each glossing condition. On the other hand, for word retention, no common significant difference in all glossing conditions was obtained in favor of one type of text.

On the other hand, it was discovered that the participants in experimental groups had positive attitudes towards online glosses although their attitudes did not significantly change according to the treatment they were exposed to. The feedback questionnaire and interview findings indicated that the most of the participants found the reading materials appropriate to their proficiency levels. Likewise, a majority of them liked reading the narrative text more

than the expository texts since they thought that the language of the story was more understandable. Moreover, their responses indicated that they preferred to read narrative texts more than expository texts in their daily lives. However, the interview results showed that the topic of the texts seemed to be an important reason for liking a certain type of text genre. In addition, even though their opinions about the difficulty of the texts indicated that they found textbook article slightly more difficult than the others in terms of vocabulary difficulty, the vast majority of them rated all of the texts moderately difficult in general.

The multimedia glosses were found to be useful for text comprehension and vocabulary learning. Almost all of the participants found Turkish translations and pictures more helpful in the glosses. On the other hand, learning styles of the participants seemed to be more effective on their perceptions of which glossing mode they found more helpful in the results of the interviews. The findings from the feedback questionnaire and semi-structured interviews supported the positive effects of multimedia glossing on both L2 text comprehension and vocabulary learning as suggested by the findings of the experimental part of the study.

Pedagogical implications.

Integrating hypermedia in learning environment, especially in language learning can have positive and noteworthy learning outcomes. This study's findings present the effectiveness of combination of multimedia glosses on the enhancement of both L2 reading comprehension and vocabulary learning along with vocabulary retention. In this regard, the study provides significant pedagogical implications for language learners, teachers, material developers, syllabus designers and the researchers who are interested in vocabulary teaching and reading skills.

In the light of the current study's results, it can be suggested that learners in second or foreign language classrooms can be more interested and motivated by means of multimedia glosses. During reading, learners' attention to new vocabulary can be raised by glosses. With a rich context in reading materials, more vocabulary can be learned through glosses. Therefore, learners can have a better comprehension of reading materials with less effort and difficulty. In addition, learning vocabulary can take less time and be more enjoyable since dictionary consultation is reduced, and incorrect guessing of the meanings of unknown words from the reading context is prevented. In comparison to traditional reading environments, learners are able to have a faster and more frequent access to information available through glosses in hypermedia reading environments.

The combination of different modes of glosses can provide learners with different perceptual learning styles an opportunity to promote their vocabulary learning and reading comprehension in an L2. Since the results of the study indicated that the combination of textual, pictorial and audio glosses was more effective on the participant's vocabulary gain and comprehension of L2 texts, the presentation of both pictures and sound in glosses can facilitate vocabulary learning and the retention of words in learners' minds. Moreover, L2 learners' comprehension of reading materials from diverse genres can be facilitated with multimedia glosses.

By means of multimedia glosses, learners can be more autonomous during reading activities as individualized learning is promoted by the interaction between reader and text. Thus, the burden of teachers will be relieved during reading process. Considering the advantages of glosses, the findings of this study suggest language teachers to integrate mediated glosses into their courses for promoting learners' vocabulary learning and reading process. Using sound, picture and textual information together, they can address their learners' various perceptions and can reduce the cognitive overload of their working memories by activating dual channels. With the integration of multimedia features into their classrooms, language teachers can make their courses more enjoyable or interesting for their students. Thus, learning environment can be more attention-grabbing and contribute to learning process. Furthermore, the study encourages teachers to use authentic texts with various text genres by glossing unknown words with pictures and audio recordings. This study indicates that language teachers should be careful about text difficulty, text genre, learning styles of their learners and topic interest before preparing materials for the use of learners.

Additionally, this study suggests material developers and syllabus designers to integrate technology, especially multimedia into EFL curriculum. More syllabi, course books or supplementary materials should be developed or designed with the incorporation of glosses into the related sections elaborately. They should consider selecting or developing useful and suitable reading materials by using different types of glosses for difficult, abstract and target words to facilitate vocabulary learning and reading comprehension of learners. Material developers need to be careful about which gloss types to use according to language proficiency levels. Since learning styles and preferences of learners are important factors for the effectiveness of glosses, material developers can create various glossing options for learners to choose during reading process. In this way, learners can make their choices and get better advantage of glosses. To conclude, because the preparation of various combinations of

multimedia glosses is an arduous and difficult task, material developers should collaborate with software designers productively for the purpose of designing effective and useful multimedia applications.

Limitations of the study.

The study has some limitations that should be considered before interpreting the results. First of all, this study was carried out with teacher candidates learning English as a foreign language for academic purposes in an ELT program at a specific university in Turkey. The participants were assumed to have similar proficiency levels of English. Therefore, the results cannot be generalized to the population unless the study is replicated with different individuals in other learning contexts.

Second, some learner differences such as learning styles, reading and vocabulary learning strategies, motivation, previous topic knowledge, working memory capacity might have influenced the participants' performances and the results of the study. These factors were not examined in the current study.

Third, the present study was conducted on certain times with three different texts due to space restrictions on the computer laboratory. The participants read all three texts and answered reading comprehension and vocabulary tests successively on the same day. Although the participants were allowed take breaks, they might have been tired of reading three texts.

Fourth, three different texts from narrative and expository genres were utilized to understand the effects of the text types on reading comprehension and vocabulary retention of the participants. The numbers of the texts are not enough to generalize the findings of the study.

Fifth, the participants' comprehension and vocabulary learning were assessed with recognition tests. They were evaluated with assessment tests that were not in line with all treatment modalities. The tests used only textual information. Pictures or audio recordings were not included in the assessment. However, the results might have been different if the tests utilized multimedia features presenting visual and auditory modalities, and the participants were assessed at production level, as well.

Suggestions for future research.

Further research is needed to be conducted to understand the effectiveness of mediated glosses on different language learners' reading comprehension and vocabulary learning

thoroughly and to confirm the results of the present study. The study could also be replicated to compare the findings across different levels of language proficiency.

Another dimension like animation or video may be integrated into multimedia glosses and thus, various combinations of multimedia features may be investigated for their effectiveness on L2 learners' comprehension of text and vocabulary learning.

To get a better understanding of text effects through glosses, more reading materials need to be selected with similar difficulties and glossed with various multimedia features. Therefore, more valid results may be achieved and generalization of the findings may be possible.

Individual differences were not examined and controlled in this study. For this reason, it is recommended that further research on multimedia glosses take individual differences into account for the understanding of the phenomenon. Especially, participants should be assigned to groups regarding their learning styles, and they should be exposed to treatments which will include various combinations of multimedia glosses according to their perceptual learning styles. This will shed more light upon our understanding of the effects of multimedia glosses on reading comprehension and vocabulary learning of second or foreign language learners.

The present study did not utilize multimedia features in the assessment process. It is suggested that further researchers adapt evaluation methods to treatment conditions. Besides, the assessment of learners' performance can be carried out with production tests like open-ended questions as well.

In order to have a deeper understanding of the effectiveness of multimedia glosses on vocabulary learning and text comprehension, more qualitative data should be obtained to gain insight into the reading process. Think aloud protocols may be a useful and effective way to understand learners' thinking processes and the strategies they utilize during the interaction with the text and glosses.

Finally, a longitudinal study where the multimedia glosses are integrated into the curriculum will provide more valid results and add profound insight to our understanding of the phenomenon.

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APPENDICES

APPENDIX A: Reading Text 1

MARTIN LUTHER KING

"Martin Luther King was born on January 15, 1929, in Atlanta, Georgia. He was the son of the Reverend Martin Luther King, Sr. and Alberta Williams King. He had an older sister, Willie Christine King, and a younger brother Alfred Daniel Williams King. Growing up in Atlanta, King attended Booker T. Washington High School. He skipped ninth and twelfth grade, and entered Morehouse College at age fifteen without formally graduating from high school. From the time that Martin was born, he knew that black people and white people had different rights in certain parts of America. If a black family wanted to eat at a restaurant, they had to sit in a separate section of the restaurant. They had to sit at the back of the cinema, and even use separate toilets. Worse, and perhaps even more humiliating still, in many southern states, if a black man was on a bus and all the seats were taken, he would have to endure the **indignity** of **relinquishing** his own seat to a white man. King could never understand the terrible injustice of this.

In 1948, he graduated with a Bachelor of Arts degree in sociology. Later, King began doctoral studies in systematic theology at Boston University and received his Doctor of Philosophy on June 5, 1955. King married Coretta Scott, on June 18, 1953, and they had four children.

Returning to the South to become **pastor** of a Baptist Church in Montgomery, Alabama, King first achieved national renown when he helped mobilize the black boycott of the Montgomery bus system in 1955. This was organized after Rosa Parks, a black woman, refused to give up her seat on the bus to a white man – in the **segregated** south, black people could only sit at the back of the bus. The 382-day boycott led the bus company to change its regulations, and the Supreme Court declared such segregation unconstitutional.

In 1957 King was active in the organization of the Southern Leadership Christian Conference (SCLC), formed to co-ordinate protests against discrimination. He advocated non-violent direct action based on the methods of Gandhi, who led protests against British rule in India **culminating** in India's independence in 1947. In 1963, King led mass protests against discriminatory practices in Birmingham, Alabama, where the white population were violently resisting **desegregation**. The city was **dubbed** 'Bombingham' as attacks against civil rights

protesters increased, and King was arrested and jailed for his part in the protests.

After his release, King participated in the enormous civil rights march, in Washington, in August 1963, and delivered his famous 'I have a dream' speech, predicting a day when the promise of freedom and equality for all would become a reality in America. In 1964 he was awarded the Nobel Peace Prize. In 1965, he led a campaign to register blacks to vote. The same year the US Congress passed the Voting Rights Act outlawing the discriminatory practices that had **barred** blacks from voting in the south.

As the civil rights movement became increasingly radicalized, King found that his message of peaceful protest was not shared by many in the younger generation. King began to protest against the Vietnam War and poverty levels in the US. On March 29, 1968, King went to Memphis, Tennessee, in support of the black **sanitary** public works employees who had been on **strike** since March 12 for higher wages and better treatment. In one incident, black street repairmen had received pay for two hours when they were sent home because of bad weather, but white employees had been paid for the full day. King could not bear to stand by and let such patent acts of racism go unnoticed. He moved to unite his people, and all the peoples of America on the receiving end of discriminatory practices, to protest for their rights, peacefully but steadfastly.

On his trip to Memphis, King was booked into room 306 at the Lorraine Motel, owned by Walter Bailey. King was shot at 6:01 p.m. April 4, 1968 while he was standing on the motel's second-floor balcony. King was rushed to St. Joseph's Hospital, where doctors opened his chest and performed manual heart massage. He was pronounced dead at 7:05 p.m. King's autopsy revealed that although he was only 39 years old, he had the heart of a 60-year-old man."

Source: https://www.ielts-mentor.com/reading-sample/academic-reading/2561-ielts-academic-reading-sample-178-martin-luther-king Retrieved on January the 12th, 2018

APPENDIX B: Reading Text 2

Ernest Hemingway – 'Cat in the Rain'

"There were only two Americans stopping at the hotel. They did not know any of the people they passed on the stairs on their way to and from their room. Their room was on the second floor facing the sea. It also faced the public garden and the war monument. There were big palms and green benches in the public garden.

In the good weather there was always an artist with his **easel**. Artists liked the way the palms grew and the bright colors of the hotels facing the gardens and the sea.

Italians came from a long way off to look up at the war monument. It was made of bronze and **glistened** in the rain. It was raining. The rain **dripped** from the palm trees. Water stood in pools on the **gravel** paths. The sea broke in a long line in the rain and slipped back down the beach to come up and break again in a long line in the rain. The motor cars were gone from the square by the war monument. Across the square in the doorway of the café a waiter stood looking out at the empty square.

The American wife stood at the window looking out. Outside right under their window a cat was **crouched** under one of the dripping green tables. The cat was trying to make herself so compact that she would not be dripped on.

'I'm going down and get that kitty,' the American wife said.

'I'll do it,' her husband offered from the bed.

'No, I'll get it. The poor kitty out trying to keep dry under a table.'

The husband went on reading, lying propped up with the two pillows at the foot of the bed.

'Don't get wet,' he said.

The wife went downstairs and the hotel owner stood up and bowed to her as she passed the office. His desk was at the far end of the office. He was an old man and very tall.

'Il piove,[1] 'the wife said. She liked the hotel-keeper.

'Si, Si, Signora, brutto tempo[2] . It is very bad weather.'

He stood behind his desk in the far end of the dim room. The wife liked him. She liked the deadly serious way he received any complaints. She liked his dignity. She liked the way he wanted to serve her. She liked the way he felt about being a hotel-keeper. She liked his old, heavy face and big hands.

Liking him she opened the door and looked out. It was raining harder. A man in a rubber cape was crossing the empty square to the café. The cat would be around to the right. Perhaps she could go along under the **eaves.** As she stood in the doorway an umbrella opened behind her. It was the maid who looked after their room.

'You must not get wet,' she smiled, speaking Italian. Of course, the hotel-keeper had sent her.

[1] 'It's raining.'
[2] 'Yes, yes Madam. Awful weather.'

With the maid holding the umbrella over her, she walked along the gravel path until she was under their window. The table was there, washed bright green in the rain, but the cat was gone. She was suddenly disappointed. The maid looked up at her.

'Ha perduto qualque cosa, Signora?'[3]

'There was a cat,' said the American girl.

'A cat?'

'Si, il gatto.'

'A cat?' the maid laughed. 'A cat in the rain?'

'Yes, –' she said, 'under the table.' Then, 'Oh, I wanted it so much. I wanted a kitty.'

When she talked English the maid's face tightened.

'Come, Signora,' she said. 'We must get back inside. You will be wet.'

'I suppose so,' said the American girl.

They went back along the gravel path and passed in the door. The maid stayed outside to close the umbrella. As the American girl passed the office, the **padrone** bowed from his desk. Something felt very small and tight inside the girl. The padrone made her feel very small and at the same time really important. She had a momentary feeling of being of supreme importance. She went on up the stairs. She opened the door of the room. George was on the bed, reading.

'Did you get the cat?' he asked, putting the book down.

'It was gone.'

'Wonder where it went to,' he said, resting his eyes from reading.

She sat down on the bed.

'I wanted it so much,' she said. 'I don't know why I wanted it so much. I wanted that poor kitty. It isn't any fun to be a poor kitty out in the rain.'

George was reading again.

She went over and sat in front of the mirror of the dressing table looking at herself with the hand glass. She studied her profile, first one side and then the other. Then she studied the back of her head and her neck.

'Don't you think it would be a good idea if I let my hair grow out?' she asked, looking at her profile again.

George looked up and saw the back of her neck, **clipped** close like a boy's.

'I like it the way it is.'

'I get so tired of it,' she said. 'I get so tired of looking like a boy.'

George shifted his position in the bed. He hadn't looked away from her since she started to speak.

'You look pretty darn nice,' he said.

She laid the mirror down on the dresser and went over to the window and looked out. It was getting dark.

'I want to pull my hair back tight and smooth and make a big knot at the back that I can feel,' she said. 'I want to have a kitty to sit on my lap and **purr** when I stroke her.'

[3] 'Have you lost something, Madam?'

‘Yeah?’ George said from the bed.

‘And I want to eat at a table with my own silver and I want candles. And I want it to be spring and I want to brush my hair out in front of a mirror and I want a kitty and I want some new clothes.’

‘Oh, shut up and get something to read,’ George said. He was reading again.

His wife was looking out of the window. It was quite dark now and still raining in the palm trees.

‘Anyway, I want a cat,’ she said, ‘I want a cat. I want a cat now. If I can’t have long hair or any fun, I can have a cat.’

George was not listening. He was reading his book. His wife looked out of the window where the light had come on in the square.

Someone knocked at the door.

‘Avanti,’ George said. He looked up from his book.

In the doorway stood the maid. She held a big **tortoiseshell** cat pressed tight against her and swung down against her body.

‘Excuse me,’ she said, ‘the padrone asked me to bring this for the Signora.’”

Source: https://xpressenglish.com/our-stories/cat-in-the-rain Retrieved on January 13th, 2018

APPENDIX C: Reading Text 3

Zulu Beadwork

“The South African province of KwaZulu-Natal, more commonly referred to as the Zulu Kingdom, is named after the Zulu people who have inhabited the area since the late 1400s. KwaZulu translates to mean "Place of Heaven." "Natal" was the name the Portuguese explorers gave this region when they arrived in 1497. At that time, only a few Zulu clans occupied the area. By the late 1700s, the AmaZulu clan, meaning "People of Heaven," constituted a significant nation. Today the Zulu clan represents the largest ethnic group in South Africa, with at least 11 million people in the kingdom. The Zulu people are known around the world for their elaborate glass **beadwork**, which they wear not only in their traditional costumes but as part of their everyday **apparel**. It is possible to learn much about the culture of the Zulu clan through their beadwork.

The glass bead trade in the province of KwaZulu-Natal is believed to be a fairly recent industry. In 1824, an Englishman named Henry Francis Fynn brought glass beads to the region to sell to the African people. Though the British are not considered the first to introduce glass beads, they were a main source through which the Zulu people could access the **merchandise** they needed. Glass beads had already been manufactured by the Egyptians centuries earlier around the same time when glass was discovered. Some research points to the idea that Egyptians tried to fool South Africans with glass by passing it off as jewels similar in value to gold or ivory. Phoenician **mariners** brought cargoes of these beads to Africa along with other wares. Before the Europeans arrived, many Arab traders brought glass beads down to the southern countries via camelback. During colonization', the Europeans facilitated and monopolized the glass bead market, and the Zulu nation became even more closely tied to this art form.

The Zulu people were not fooled into believing that glass beads were precious stones but, rather, used the beads to establish certain codes and rituals in their society. In the African tradition, kings were known to wear beaded **regalia** so heavy that they required the help of attendants to get out of their thrones. Zulu beadwork is involved in every realm of society, from religion and politics to family and marriage. Among the Zulu women, the craft of beadwork is used as an educational tool as well as a source of recreation and fashion. Personal **adornment** items include jewelry, skirts, neckbands, and **aprons**. Besides clothing and accessories, there are many other beaded objects in the Zulu culture, such as bead-covered **gourds**, which are carried around by women who are having fertility problems. Most importantly, however, Zulu beadwork is a source of communication. In the Zulu tradition,

beads are a part of the language with certain words and symbols that can be easily read. A finished product is considered by many artists and collectors to be extremely poetic.

The code behind Zulu beadwork is relatively basic and extremely resistant to change. A simple **triangle** is the geometric shape used in almost all beaded items. A triangle with the **apex** pointing downward signifies an unmarried man, while one with the tip pointing upward is worn by an unmarried woman. Married women wear items with two triangles that form a diamond shape, and married men signify their marital status with two triangles that form an hourglass shape. Colors are also significant, though slightly more complicated since each color can have a negative and a positive meaning. Educated by their older sisters, young Zulu girls quickly learn how to send the appropriate messages to a courting male. Similarly, males learn how to interpret the messages and how to wear certain beads that express their interest in marriage.

The codes of the beads are so strong that cultural analysts fear that the beadwork tradition could prevent the Zulu people from progressing technologically and economically. Socioeconomic data shows that the more a culture resists change the more risk there is in a value system falling apart. Though traditional beadwork still holds a serious place in Zulu culture, the decorative art form is often modified for tourists, with popular items such as the beaded fertility doll."

Source: Lougheed, L. (2006). *Barron's ILETS with audio CD: International English Language Testing System*. Barron's Educational Series, New York.

APPENDIX D: Vocabulary Checklist

Vocabulary	Put a ✓if you know the word	Write its meaning either in English or in Turkish if you know the word
Throne (n):		
Clip (v):		
Purr (v):		
Clan (n):		
Relinquish (v):		
Gourd (n):		
Sanitary (adj):		
Tortoiseshell (n):		
Bead (n):		
Apparel (n):		
Province (n):		
Rubber (n):		
Merchandise (n):		
Ivory (n):		
Mariner (n):		
Square (n):		
Regalia (n):		
Constitute (v):		
Adornment (n):		
Apron (n):		
Autopsy (n):		
Realm (n):		
Facilitate (v):		
Triangle (n):		
Bow (v):		
Apex (n):		
Knot (n):		

Gravel (n):		
Indignity (n):		
Racism (n):		
Advocate (n):		
Pastor (n):		
Segregated (adj):		
Pillow(n):		
Culminate in/ with (v):		
Desegregation (n):		
Dub (v):		
Poverty (n):		
Bar (v):		
Fertility (n):		
Padrone (n):		
Easel (n):		
Monument (n):		
Glisten (v):		
Drip (v):		
Crouch (v):		
Eaves (n):		
Strike (n):		
Palm (n):		

APPENDIX E: Reading Comprehension Questions for Text 1

Read the text 'Martin Luther King' and then answer the following questions

1. The city 'Birmingham' was named 'Bombingham' because…
    a. the white population were not resisting desegregation
    b. there were mass protests against racist actions in the city
    c. Martin Luther King was shot on a hotel's balcony
    d. the civil rights protesters were violently attacked.

2. In which of the following did not Martin Luther King have any role?
    a. a movement to end discriminatory voting rights
    b. the organization of Southern Leadership Christian Conference (SCLC)
    c. protests against British authority in India
    d. protests against the Montgomery bus system

3. When did the black boycott of the Montgomery bus system start?
    a. when segregation in the southern bus system was declared unconstitutional by the supreme court
    b. after Rosa Parks did not relinquish her seat to a white man in a bus
    c. before Martin Luther King became a pastor in a church in Montgomery
    d. after Martin Luther King was imprisoned for his actions in the protests

4. What led Martin Luther King start to protest against Vietnam War?
    a. poverty conditions in the US
    b. the actions of politicians
    c. the violent actions of younger generation
    d. the black employees' protests for higher payments

5. When did Martin Luther King begin to have college education?
    a. before his family moved to Atlanta
    b. after he got married Coretta Scott
    c. after he graduated high school at the age of seventeen
    d. before he finished ninth and tenth grade in high school

6. From a young age Martin Luther King…
    a. wanted to protest for the rights of black people
    b. could not understand why black people were treated differently
    c. was not allowed to go to the cinema or to restaurants
    d. was aware that black people were being humiliated in many northern states

7. What initially made Martin Luther King famous?
    a. the black boycott of the Montgomery bus system
    b. becoming a pastor at a Baptist Church
    c. when he delivered his 'I have a dream' speech
    d. when he persuaded Rosa Parks not to give up her bus seat to a white man

8. What influenced Martin Luther King regarding non-violence?
    a. protests against Vietnam War
    b. the methods of Gandhi
    c. Christianity
    d. the Southern Leadership Christian Conference

9. What did Martin Luther King fight for in 1965?

a. the right of black people to vote
b. the actions of the US Congress
c. the right to win the Nobel Peace Prize
d. the right of black people to travel abroad

Do the following statements agree with the information given in the text? For each statement, choose

True (T)	if the statement agrees with the information
False (F)	if the statement contradicts the information
Not Given (NG)	if there is no information on this for

1. ____ Martin Luther King is also known widely for his 'I have a dream' speech.

2. ____ Martin Luther was awarded the Nobel Peace Prize after the black boycott of Montgomery bus system.

3. ____ Martin Luther King was in favor of supporting non-violent protests against civil rights movements.

4. ____ Martin Luther King died in a car accident on his trip to Memphis.

5. ____ Martin Luther King's four children actively attended the protest with their father.

6. ____ The black boycott of the Montgomery bus system was a success.

APPENDIX F: Reading Comprehension Questions for Text 2

Read the text 'Cat in the Rain' and then answer the following questions

1. Which of the following is not a character of the story?
   a. George
   b. the owner of the hotel
   c. a maid
   d. an Italian driver

2. Why does she want to go outside and get the cat in the rain?
   a. She loves cats and wants to keep it
   b. She wants to help the injured cat
   c. She wants to feed the cat
   d. The cat is crouching under one of the dripping green tables

3. Why does the woman like the hotel owner so much?
   a. He makes her feel very small
   b. He dresses in a dignified way
   c. He is always caring and respectful toward her
   d. He reminds her of her father

4. Why does the American wife say that she wants to let her hair to grow out, even though her husband tells her that he likes it the way it is?
   a. She thinks that she looks like a boy
   b. She is angry at her husband for not getting what she wants
   c. She wants to look attractive to other men in the hotel
   d. She wants to try different hair styles that match to her dresses
5. After talking about her hair, the woman says, "I want a cat to hold and sit with, and that will make happy noises when I stroke her." What does this suggest to the reader?

   a. that she feels lonely in the hotel and wants a company
   b. that she really loves cats and must have one
   c. that she doesn't love her husband any more
   d. that she wants something to do when his husband is outside

6. Which of the following is not among the American wife's wishes?
   a. a kitty
   b. new garments
   c. eating at table with candles
   d. reading a book with her husband

7. What is the American husband doing while his wife goes outside in the rain?
   a. He is going after his wife with an umbrella
   b. He is calling for the hotel's room service
   c. He is lying on the bed and reading
   d. He is standing at the window looking out

8. Who brought the umbrella for the American wife?
   a. her husband
   b. the maid of the hotel
   c. the padrone of the hotel

d. the waiter of the café

9. How does George react to his wife's wishes at the end of the story?
   a. he listens to his wife very carefully
   b. he promises to buy what she wants after they return to America
   c. he is indifferent to her wishes and keeps on reading
   d. he gets upset and leaves his wife alone in the hotel room

Do the following statements agree with the information given in the text? For each statement, choose

True (T)	if the statement agrees with the information
False (F)	if the statement contradicts the information
Not given (NG)	if there is no information on this

1. ____ The woman's problems are solved at the end of the story

2. ____ The big tortoiseshell cat and the cat in the rain are the same.

3. ____ The American wife is happy and cheerful throughout the story.

4. ____ The husband, George ignores his wife and reads his book in his bed when his wife makes a list of her desires.

5. ____ The American wife finds the cat outside when she goes downstairs to rescue it.

6. ____ The husband asks the hotel-keeper to find and bring a tortoiseshell cat for his wife.

APPENDIX G: Reading Comprehension Questions for Text 3

Read the text 'Zulu Beadwork' and then answer the following questions

1. Who gave the name 'Natal' to the South African province of KwaZulu?
    a. Egyptians
    b. Henry Francis Fynn
    c. Portuguese explorers
    d. Phoenician mariners

2. What makes the Zulu people famous all around the world?
    a. their marriage rituals
    b. their traditional clothes
    c. ivory
    d. glass beadwork

3. Which of the following is true about the glass bead trade in the province of KwaZulu-Natal?
    a. The Europeans brought cargoes of glass beads to South Africa
    b. It is believed that the glass bead trade in KwaZulu dates back to old times
    c. Arab traders brought glass beads to the province to change them with gold
    d. With colonization, glass bead trade became more prevalent in the Zulu nation

4. The Zulu people could mainly supply the goods they needed through…
    a. Egyptians
    b. The British
    c. Arab traders
    d. South Africans

5. According to the text, what is most important about Zulu beadwork?
    a. It is used to adorn personal items
    b. It is used for communication
    c. It is used to heal fertility problems
    d. It is used as an educational tool

6. The Zulu women who have problems in having a child use…
    a. jewelry
    b. items with geometric shapes
    c. beaded regalia
    d. bead-covered gourds

7. To show their marital status, the Zulu people wear…
    a. beaded items with triangles
    b. beaded items with circles
    c. beaded adornment items
    d. beaded colorful items

8. The codes of the beads…
    a. are resistant to change
    b. are difficult to understand
    c. are losing their importance in the Zulu culture
    d. are getting complicated for younger generation

9. According to cultural analysts…

a. the Zulu people live in poverty levels due to cheap bead trade
b. the Zulu people have educational problems due to beadwork tradition
c. beadwork tradition makes the interaction between Zulu people and other cultures difficult
d. beadwork tradition can hinder economic and technological development in the province

Do the following statements agree with the information given in the text? For each statement, choose

True (T)	if the statement agrees with the information
False (F)	if the statement contradicts the information
Not Given (NG)	if there is no information on this

1. ____ The Zulu clan is the largest ethnic community in South Africa.

2. ____ The Zulu people use beadwork only in their traditional clothes.

3. ____ It is impossible to learn about the culture of the Zulu clan through their beadwork.

4. ____ The British are the first to introduce the glass beads to the Zulu people.

5. ____ The Zulu people give elaborate beaded objects to their king as a present to show their respect.

6. ____ Married women wear items with diamond shape to signify their marital status.

APPENDIX H: Immediate Vocabulary Test

Choose the best option that matches the word or definition

1. 'To happen or exist as the final result of a process or situation'
a. restrict b. register c. culminate d. pronounce

2. 'To let someone else have your position, power, or rights, especially unwillingly'
a. possess b. refuse c. relinquish d. segregate

3. 'Set apart or separated from others of the same kind, gender, color or race'
a. attacked b. segregated c. resisted d. limited

4. 'A situation that makes you feel embarrassed or ashamed'
a. injustice b. inequality c. hatred d. indignity

5. 'A priest in some Protestant churches'
a. clerk b. counselor c. sanitary d. pastor

6. 'Dub' means….
a. to lose respect and look silly in a situation
b. to make a formal speech to a large group of people
c. to give someone or something a particular name or description
d. to separate one group of people from others

7. 'Strike' means…
a. expressing a different opinion from someone else
b. competing against another person or group in a battle, competition, or election
c. showing the truth about someone or something, especially when it is bad
d. stopping working for a period of time because you want more money

8. 'Bar' means ….
a. to prohibit someone from doing something or from going somewhere
b. to be glad that something has happened because you think it is a good idea
c. to take something important or necessary away from someone or something
d. to accept that someone or something has authority over people

9. 'Desegregation' means ……
a. allowing something to be taken away from you
b. officially preventing someone from entering a place or from doing something
c. a very quiet and pleasant situation in which you are not interrupted
d. ending a system in which people of different races are kept separate

10. 'Sanitary' means…
a. separated according to race, sex, or religion
b. relating to the conditions that affect hygiene
c. the condition of being mentally unhealthy
d. relating to the part of the legal system that is concerned with crime

11. 'To lower your body close to the ground by bending your knees'

a. crouch b. prop c. slip d. shift

12. 'To cut something to make it shorter or tidier'

a. drip b. tighten c. glisten d. clip

13. 'A wooden frame that you put a painting on while you paint it'

a. knot b. easel c. palm d. dim

14. 'To make or utter a soft vibrant sound as a cat does to show pleasure'

a. grumble b. squeak c. purr d. crouch

15. 'To shine with a sparkling light'

a. tighten b. glisten c. strike d. clash

16. 'Gravel' means

a. small stones, used to make a surface for paths, roads
b. the top layer of the earth in which plants grow
c. a substance consisting of very small pieces of rocks and minerals, that forms beaches and deserts
d. a black sticky substance that becomes hard when it dries, used for making the surface of roads

17. 'Padrone' means

a. an owner or manager, especially of an inn or hotel
b. a female servant, especially in a large house or hotel
c. the person who is the strongest in a relationship, who controls a situation
d. the main male servant of a house

18. 'Eaves' mean

a. a wide pipe that allows smoke from a fire to go out through the roof
b. the structure that covers or forms the top of a building, vehicle, tent etc
c. the roof of a house, often used for storing thing
d. the lower border of a roof that overhangs the wall a space or room just below

19. 'Tortoiseshell' means

a. a small smooth round stone, especially one found on a beach
b. a hard shiny brown and white material made from the shell of a snail
c. a kind of turtle that lives mainly in pounds and lakes
d. a kind of cat with yellow, orange, white and black fur

20. 'Drip' means

a. to move or drop down from a higher position to a lower position
b. to make something smaller or less in size, amount, or price
c. to let liquid fall in drops
d. to put something into a liquid and lift it out again

21. 'A flat shape with three straight sides and three angles'

a. hourglass b. rectangle c. diamond d. triangle

22. 'A round fruit whose outer shell can be used as a container, or the container made from this fruit'

a. gourd b. bead c. grape d. pear

23. 'Traditional clothes and decorations, used at official ceremonies'

a. apron b. throne c. regalia d. fertility

24. 'One of a set of small, usually round, pieces of glass, wood, plastic etc, that you can put on a string and wear as jewelry'

a. regalia b. apron c. bead d. earring

25. 'Something that you wear to protect the front of your clothes, especially when you are cooking'

a. skirt b. apron c. neckband d. regalia

26. 'Apex' means

a. an area of a land that is higher than the land around it
b. the top or highest part of something
c. a shape that has four straight sides
d. a line that gradually bends like part of a circle

27. 'Adornment' means

a. something that is used to celebrate traditional annual events
b. something that is for sale, usually not in a shop
c. something that is used to decorate things to make them more beautiful
d. something used in a particular place for the preparation or serving of food

28. 'Mariner' means

a. trader b. merchant c. sailor d. pirate

29. 'Merchandise' means

a. a person who buys and sell things
b. a person, event, or thing that makes something happen
c. something produced using skill and experience
d. goods that are being sold, bought or traded

30. 'Apparel' means

a. the particular physical form or appearance of something
b. decorative objects worn on your clothes or body that are usually made from valuable metals
c. things such as dresses and trousers that you wear to cover, protect, or decorate your body
d. items for sale, or possessions that can be moved

APPENDIX I: Background Questionnaire

Dear prospective teacher,
This questionnaire was prepared to investigate the influence of multimedia-glosses on reading comprehension and vocabulary learning of English language learners. This is for research purposes only, and your responses will be kept confidential. Thank you!
Please choose or write the answer that is appropriate to you after reading each statement.

1. **Name- Surname**:_____
   Username (the code given by the researcher):_____

2. **Age:**_____

3. **Gender:** Male___ Female___

4. **Grade Level**: 2___ 3___

5. **Your English Level?**
   Pre-intermediate__ Intermediate___ Upper-intermediate___ Advanced___

6. **What is your cumulative grade point average at Ataturk University?**

   a. 3.5- 4.0
   b. 2.5- 3.4
   c. 1.5- 2.4
   d. 0.5- 1.4

7. **What is your native language?_____**

8. **How many hours do you study English outside of the class per day?**
   a. Less than an hour
   b. 1-2 hours
   c. 2-3 hours
   d. More than 3 hours

9. **At which level did you start learning English at school?**
   a. Kindergarten _____
   c. Secondary level: Grade _____
   b. Primary level: Grade _____
   d. Other _____

10. **How long have you studied English?**
    1-3 years___ 3-5 years____ 5-7 years___ more than 7 years___

11. **Which language skill/s do you use in English most of the time?** (Put an X on the space provided. You can choose more than one response)
    a. Writing _____
    b. Speaking _____
    d. Listening _____
    c. Reading _____

12. How do you rate your overall proficiency? (Put an X on the space provided for each item)

	1: Poor	***2: Fair***	***3: Average***	***4: Good***	***5: Excellent***
Foreign language learner:	1___	2___	3___	4___	5___
Reading in English:	1___	2___	3___	4___	5___
Reading in Turkish:	1___	2___	3___	4___	5___
Computer skills:	1___	2___	3___	4___	5___

13. How often do you use a dictionary while studying English?

Often__ Usually__ Sometimes__ Rarely__ Never__

14. I have anxiety about studying English.

Strongly Agree___ Agree ___ Neutral___ Disagree___ Strongly Disagree__

APPENDIX J: Attitude Questionnaire

Name-Surname:

Username:

Attitude Questionnaire towards Online Glosses

In an effort to help us understand how learners succeed in learning with online glosses, we would appreciate your answers to the following items. Your responses will be kept confidential and used for research purposes only.

Rate your reaction to the following statements by circling the response, which is the closest to how you feel.

1: Strongly Agree, 2: Agree, 3: Neutral, 4: Disagree, 5: Strongly Disagree

1. The online glosses helped me learn the new words.	1__ 2__ 3__ 4__ 5__
2. The online glosses helped me understand the texts.	1__ 2__ 3__ 4__ 5__
3. The online glosses were clear and understandable.	1__ 2__ 3__ 4__ 5__
4. I liked reading the texts.	1__ 2__ 3__ 4__ 5__
5. The online glosses distracted me from reading the texts.	1__ 2__ 3__ 4__ 5__
6. Online glosses are better than paper-based dictionaries.	1__ 2__ 3__ 4__ 5__
7. Online texts are better than paper-based texts.	1__ 2__ 3__ 4__ 5__
8. I would read more books for pleasure if they used online glosses.	1__ 2__ 3__ 4__ 5__
9. How often do you use online glosses?	Often_ Usually_ Sometimes_ Rarely_ Never_

APPENDIX K: Feedback Questionnaire

We would like to get some feedback about the study from you. Please note that this is for research purposes only, and your responses will be kept confidential. We would be very grateful if you could answer the questions below. Thank you!

1. **Did you find the texts you have read interesting?** (Please put an X on the space provided for each item)
   1. 'M. Luther King' text Yes___ No___
   2. 'Cat in the Rain' text Yes___ No___
   3. 'Zulu Beadwork' text Yes___ No___
2. **Which text did you like reading most?** (Please choose only one response)
   1. M. Luther King b. Cat in the Rain c. Zulu Beadwork
3. **Did you find the texts appropriate to your proficiency level?** (Put an X on the space provided for each item)
   1. 'M. Luther King' text Yes___ No___
   2. 'Cat in the Rain' text Yes___ No___
   3. 'Zulu Beadwork' text Yes___ No___
4. **Which text was the most difficult one to read for you? Why?**

   ……
   ……
5. **How would you rate the difficulty of 'Martin Luther King' text regarding the vocabulary, grammar, content, language use?** (Please check one response for each item)

	1:Very easy,	*2:Easy,*	*3:Moderate,*	*4:Difficult,*	*5: Very Difficult*
Vocabulary	1___	2___	3___	4___	5____
Grammar	1___	2___	3___	4___	5____
Content	1___	2___	3___	4___	5____
Language use	1___	2___	3___	4___	5____

6. **How would you rate the difficulty of 'Cat in the Rain' text regarding the vocabulary, grammar, content, language use?** (Please check one response for each item)

	1:Very easy,	*2:Easy,*	*3:Moderate,*	*4:Difficult,*	*5:Very Difficult*
Vocabulary	1___	2___	3___	4___	5____
Grammar	1___	2___	3___	4___	5____
Content	1___	2___	3___	4___	5____
Language use	1___	2___	3___	4___	5____

7. **How would you rate the difficulty of 'Zulu Beadwork' regarding the vocabulary, grammar, content, language use?** (Please check one response for each item)

	1:Very easy,	*2:Easy,*	*3:Moderate,*	*4:Difficult,*	*5:Very Difficult*
Vocabulary	1___	2___	3___	4___	5___
Grammar	1___	2___	3___	4___	5___
Content	1___	2___	3___	4___	5___
Language use	1___	2___	3___	4___	5___

8. **What kinds of texts do you like reading most? Rank them 1, 2, and 3** (1: the most you like, 3: the least you like)

Biography ___ Short Story____ Article ____

9. **How frequently do you read the following text types?**

	1:Never,	*2: Rarely,*	*3:Sometimes,*	*4:Often,*	*5:Very often*
Biography	1___	2___	3___	4___	5___
Short story	1___	2___	3___	4___	5___
Article	1___	2___	3___	4___	5___

10. **Did you have enough time for reading the texts and answering the questions?**

Yes____ No____

11. **How would you rate the website overall?**

Poor__ Below Average___ Average___ Good___ Excellent___

12. **How easy was it to navigate through the texts and questions on the website?**

Very easy___ Easy___ Moderate___ Difficult___ Very Difficult___

13. **How was online reading compared to paper-based reading?**

Much better___ Better___ Average___ Worse___ Much worse___

14. **How useful did you find the following for your comprehension of the texts?** (Please leave the items unchecked/empty if they do not apply to you)

1: Not at all useful, 2:Somewhat useful, 3:Useful, 4:Very useful,

1.	English definitions	1___	2___	3___	4___
2.	Example sentences	1___	2___	3___	4___
3.	Turkish translations	1___	2___	3___	4___
4.	Pictures	1___	2___	3___	4___
5.	Audio definitions	1___	2___	3___	4___

15. **How useful did you find the following in helping you remember the meaning of the vocabulary?** (Please leave the items unchecked/empty if they do not apply to you)

1: Not at all useful, 2: Somewhat useful, 3: Useful, 4: Very useful

l

1.	English definitions	1___	2___	3___	4___
2.	Example sentences	1___	2___	3___	4___
3.	Turkish translations	1___	2___	3___	4___
4.	Pictures	1___	2___	3___	4___
5.	Audio definitions	1___	2___	3___	4___

16. **Do you have any suggestions for the improvement of the website? Please share your ideas with us.**

……
……
……
……

***Would you like to participate in the interview related to this study? If yes, please write your email and contact number.

E-mail:……

Phone number:…….

APPENDIX L: Delayed Vocabulary Test

Name-Surname:
Grade/Class:

VOCABULARY TEST

Choose the best option that matches the word or definition

1. 'Apex' means…
   a. an area of a land that is higher than the land around it
   b. the top or highest part of something
   c. a shape that has four straight sides
   d. a line that gradually bends like part of a circle

2. 'Sanitary' means…
   a. separated according to race, sex, or religion
   b. relating to the conditions that affect hygiene
   c. the condition of being mentally unhealthy
   d. relating to the part of the legal system that is concerned with crime

3. 'Eaves' mean....
   a. a wide pipe that allows smoke from a fire to go out through the roof
   b. the structure that covers or forms the top of a building, vehicle, tent etc
   c. the roof of a house, often used for storing thing
   d. the lower border of a roof that overhangs the wall a space or room just below

4. 'Desegregation' means ……
   a. allowing something to be taken away from you
   b. officially preventing someone from entering a place or from doing something
   c. a very quiet and pleasant situation in which you are not interrupted
   d. ending a system in which people of different races are kept separate

5. 'Tortoiseshell' means….
   a. a small smooth round stone, especially one found on a beach
   b. a hard shiny brown and white material made from the shell of a snail
   c. a kind of turtle that lives mainly in pounds and lakes
   d. a kind of cat with yellow, orange, white and black fur

6. 'Bar' means ….
   a. to prohibit someone from doing something or from going somewhere
   b. to be glad that something has happened because you think it is a good idea
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7. 'Merchandise' means….
   a. a person who buys and sell things
   b. a person, event, or thing that makes something happen
   c. something produced using skill and experience
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8. Dub' means….

a. to lose respect and look silly in a situation
b. to make a formal speech to a large group of people
c. to give someone or something a particular name or description
d. to separate one group of people from others

9. 'Gravel' means….

a. small stones, used to make a surface for paths, roads
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c. a substance consisting of very small pieces of rocks and minerals, that forms beaches and deserts
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10. 'Adornment' means….

a. something that is used to celebrate traditional annual events
b. something that is for sale, usually not in a shop
c. something that is used to decorate things to make them more beautiful
d. something used in a particular place for the preparation or serving of food

11. 'Padrone' means….

a. an owner or manager, especially of an inn or hotel
b. a female servant, especially in a large house or hotel
c. the person who is the strongest in a relationship, who controls a situation
d. the main male servant of a house

12. 'Strike' means…

a. expressing a different opinion from someone else
b. competing against another person or group in a battle, competition, or election
c. showing the truth about someone or something, especially when it is bad
d. stopping working for a period of time because you want more money

13. 'Apparel' means….

a. the particular physical form or appearance of something
b. decorative objects worn on your clothes or body that are usually made from valuable metals
c. things such as dresses and trousers that you wear to cover, protect, or decorate your body
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14. 'Drip' means….

a. to move or drop down from a higher position to a lower position
b. to make something smaller or less in size, amount, or price
c. to let liquid fall in drops
d. to put something into a liquid and lift it out again

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a. trader b. merchant c. sailor d. pirate

16. 'Set apart or separated from others of the same kind, gender, color or race'

a. attacked b. segregated c. resisted d. limited

17. 'A priest in some Protestant churches'

a. clerk b. counselor c. sanitary d. pastor

18. 'To lower your body close to the ground by bending your knees'

a. crouch b. prop c. slip d. shift

19. 'To happen or exist as the final result of a process or situation'

a. restrict b. register c. culminate d. pronounce

20. 'A situation that makes you feel embarrassed or ashamed'

a. injustice b. inequality c. hatred d. indignity

21. 'Something that you wear to protect the front of your clothes, especially when you are cooking'

a. skirt b. apron c. neckband d. regalia

22. 'To cut something to make it shorter or tidier'

a. drip b. tighten c. glisten d. clip

23. 'A wooden frame that you put a painting on while you paint it'

b. knot b. easel c. palm d. dim

24. 'To make or utter a soft vibrant sound as a cat does to show pleasure'

a. grumble b. squeak c. purr d. crouch

25. 'To shine with a sparkling light'

a. tighten b. glisten c. strike d. clash

26. 'A round fruit whose outer shell can be used as a container, or the container made from this fruit'

a. gourd b. bead c. grape d. pear

27. 'Traditional clothes and decorations, used at official ceremonies'

a. apron b. throne c. regalia d. fertility

28. 'One of a set of small, usually round, pieces of glass, wood, plastic etc, that you can put on a string and wear as jewelry'

a. regalia b. apron c. bead d. earring

29. 'To let someone else have your position, power, or rights, especially unwillingly'

a. possess b. refuse c. relinquish d. segregate

30. 'A flat shape with three straight sides and three angles'

a. hourglass b. rectangle c. diamond d. triangle

APPENDIX M1: The List of Target Words

Bead (n)

Apparel (n)

Merchandise (n)

Mariner (n)

Regalia (n)

Adornment (n)

Apron (n)

Gourd (n)

Triangle (n)

Apex (n)

Easel (n)

Glisten (v)

Drip (v)

Gravel (n)

Crouch (v)

Eaves (n)

Padrone (n)

Clip (v)

Purr (v)

Tortoiseshell (n)

Indignity (n)

Relinquish (v)

Pastor (n)

Segregated (adj)

Culminate (v)

Desegregation (n)

Dub (v)

Bar (v)

Sanitary (adj)

Strike (n)

APPENDIX M2: Target Words with Textual Glosses

Indignity (n): Onur kırıcı durum, aşağılama
A situation that makes you lose respect or look silly, or the feeling of shame and embarrassment it gives you
*Example: Two of the diplomats suffered the **indignity** of being arrested*

Relinquish (v): Bırakmak, vazgeçmek
To allow something to be taken away from you
*Example: No one wants to **relinquish** power once they have it.*

Pastor (n): Papaz (Protestanlıkta)
A Christian priest in some Protestant churches
*Example: The **pastor** held the pages close to his face and read*

Segregated (adj): Ayrılmış
Separated according to race, sex, or religion
*Example: The students had to use racially **segregated** public restrooms*

Culminate in/ with (v): Son bulmak, sonuçlanmak
To finish with a particular event, or reach a final result after gradual development and often a lot of effort
*Example: A series of events for teachers and students will **culminate** in a Shakespeare festival next year.*

Desegregation (n): Irk ayrımına son verme
The process of ending a system in which people of different races are officially separated in a society or institution
*Example: The African Americans are still working to increase the **desegregation** movements.*

Dub (v): İsim vermek, adlandırmak
To give something or someone a name that describes them in some way
*Example: The body, thousands of years old, was found in the Alps and **dubbed** 'The Iceman'.*

Bar (v): Engel olmak, önlemek

To officially prevent someone from entering a place or from doing something

*Example: They seized his passport and **barred** him from leaving the country.*

Sanitary (adj): Hijyenik, sağlıkla alakalı

Relating to people's health, especially to the system of supplying water and dealing with human waste

*Example: Diseases were spread through poor **sanitary** conditions*

Strike (n): Grev

A period of time when workers refuse to work because of an argument with an employer about working conditions, pay levels, or job losses

*Example: The government has promised that the army will be called in to help if there is a firemen's **strike**.*

Easel (n): Ressam sehpası

Something used to support a painting while you paint it

*Example: A large photo of my parents together stood on an **easel** to my left.*

Glisten (v): Parlamak, ışıldamak(ıslak yüzey)

To shine and look wet or oily

*Example: The flame of his torch made her tears **glisten**.*

Drip (v): Damla(t)mak, damla damla ak(ıt)mak

To fall in drops

*Example: There was water **dripping** from the ceiling.*

Gravel (n): Çakıl taşı

Small pieces of stone used to make paths and road surfaces

*Example: Wheels crunched on **gravel** as a car stopped in her drive.*

Crouch (v): Çömelmek

To move your body close to the ground by bending your knees

*Example: I **crouched** behind the chair to avoid being seen.*

Eaves (n): Saçak; çatı saçakları

The edges of a roof where it is wider than the walls

Example: *The melting ice drip from the **eaves**.*

Padrone (n): Otelci, hancı

The proprietor, owner of a hotel (in Italy).

*Example: As soon as they checked into the hotel, the **padrone**'s face spread in a welcoming smile.*

Clip (v): Kırpmak, makasla kesmek

To cut small amounts of something in order to make it tidier.

*Example: The hedges had just been **clipped.***

Purr (v): Mırlamak, mırıldamak (kedi)

If a cat purrs, it makes a soft sound in its throat to show pleasure.

*Example: As soon as he stroked it, the cat began to **purr.***

Tortoiseshell (n): Tekir kedi

A cat that has yellow, brown, and black marks on its fur

*Example: Within minutes a small, **tortoiseshell** kitten nestled in my arms*

Bead (n): Boncuk

A small, round ball of glass, plastic, or wood that is used for making jewellery

*Example: She wore a string of green glass **beads** around her neck.*

Apparel (n): Kıyafet

Clothing, especially outwear

*Example: She looked lovely, despite her strange **apparel.***

Merchandise (n): Ticarî eşya, mal,

Goods that are traded, or sold in shops

*Example: We stock a broad range of **merchandise.***

Mariner (n): Denizci

People who work on boats & ships

*Example: Many **mariners** lost their lives on these rocks.*

Regalia (n): Kıyafet (geleneksel ve belirli zamanlarda/durumda giyilen)
Official and traditional special clothes and decorations, especially
those worn or carried in formal ceremonies:
*Example: The queen's **regalia** at her coronation included her crown and sceptre.*

Adornment (n): Süs, süsleme
Something that you use to decorate something
*Example: It was a building without any **adornment** or decoration*

Apron (n): Önlük
A piece of clothing you wear when cooking to keep your clothes clean
*Example: He'd had time to wash his hands and take off his rubber gloves and **apron***

Gourd (n): Sukabağı
A large fruit that has a hard shell and cannot be eaten, or the shell of this fruit used as a container
*Example: I have made several attempts to grow **gourd**.*

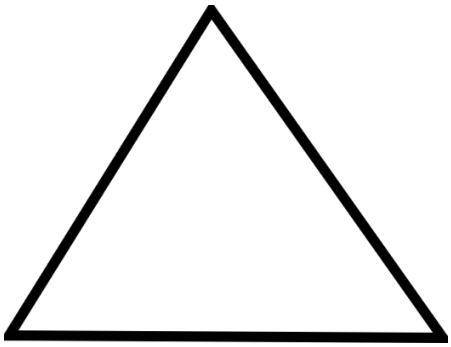
Triangle (n): Üçgen
A flat shape with three sides
*Example: A woman sells buttons with pink **triangles**.*

Apex (n): En tepe nokta
The highest part of a shape
*Example: There, under the **apex** of the roof, was a small window*

APPENDIX M3: Pictures Illustrating Target Words

Bead

Triangle



Apparel

Gourd

Apron

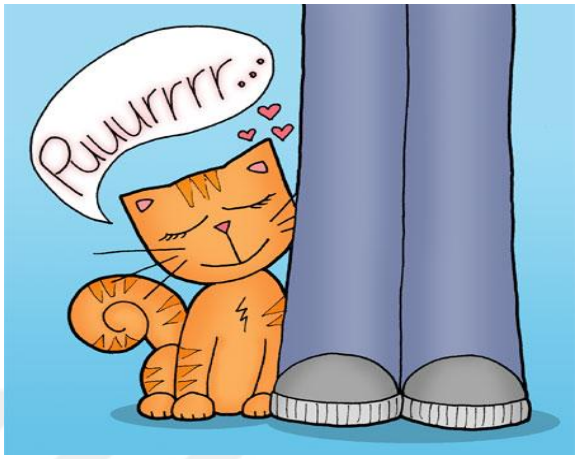
Regalia

Mariner

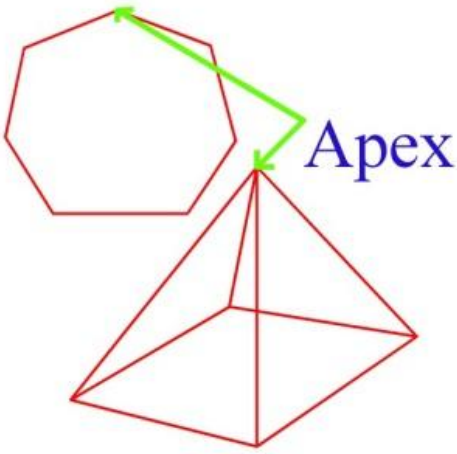
Adornment

Merchandise

Purr



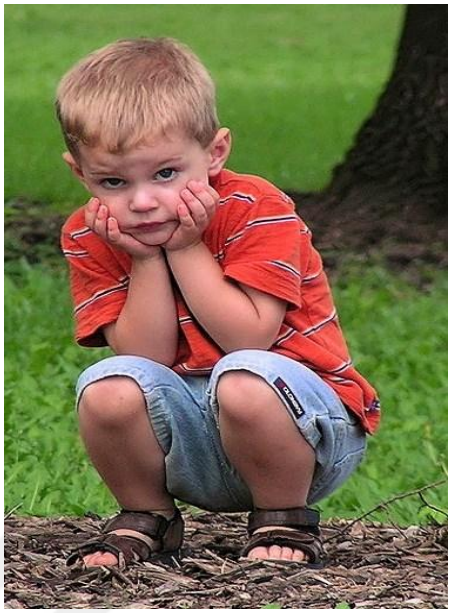
Apex



Clip

Padrone

Crouch

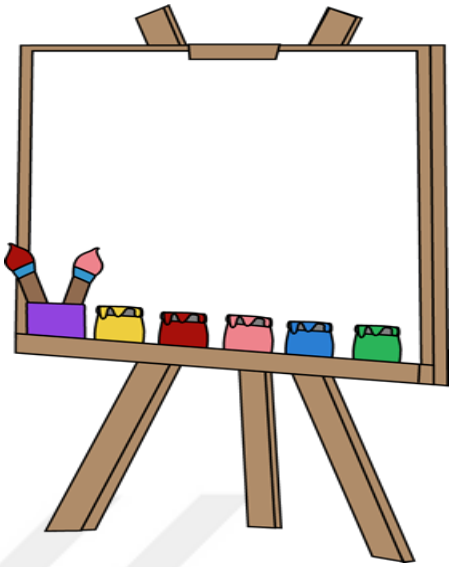


Eaves

Gravel

Drip

Easel

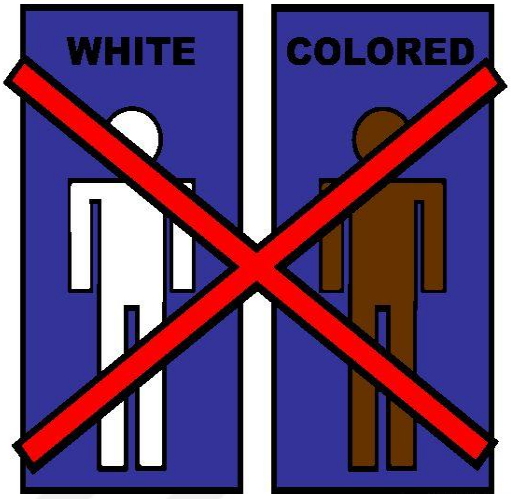


Glisten

Tortoiseshell

Bar

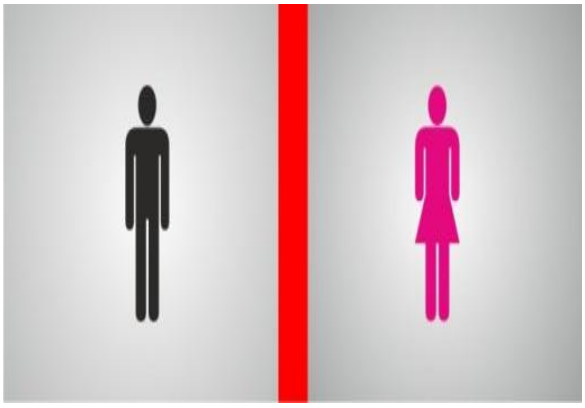
Desegregation



Dub

Culminate

Segregated



Relinquish

Pastor

Indignity

Strike

Sanitary

APPENDIX N: Semi-Structured Interview Guiding Questions

1. How did you feel while reading online? How did you find online reading?
2. Did you like reading the texts? Which one did you like most? Why?
3. Were there major differences between the texts?
    a. If yes, what were the differences?
    b. Why do you think they were different?
4. Could you understand the meanings of the target words while reading?
    a) How did you understand them?
5. How did you find the mediated glosses? Useful? Inadequate?
6. What information in the glosses did you utilized most?
    a) Picture, sound, Turkish translation, example sentence, Why?
7. Which information in glosses did you look at first? Why?
8. Did you have difficulties in vocabulary test? If yes, what were the difficulties?
9. What do you think about learning English words with pictures?
10. What do you think about getting audio information while learning English words?
11. What strategies do you use while learning vocabulary?
12. What do you think about learning English words with mediated glosses?
13. What do you think about the types of the reading texts?
    a) Do you like reading biographical texts?
    b) Do you like reading stories?
    c) Do you like reading textbook articles?
14. What kind of texts do you like reading in your daily life? Why?
15. Could you use the website easily? What do you think about the transitions from reading texts and tests?
16. What was the most striking thing in this application? Why?

APPENDIX O: The underlined words and their frequencies for each reading text

1. Text

Underlined words	The number of students
segregated	19
relinquish	18
desegregation	14
indignity	13
pastor	13
sanitary	13
steadfastly	13
dubbed	12
culminate	10
bar	10
unconstitutional	9
outlawing	8
radicalized	6
renown	6
endure	5
humiliating	5
jailed	4
discrimination	4
skip	3
advocate	3
mobilize	3
autopsy	2
chest	2
declare	2
campaign	2
mass	2
incident	2
boycott	1
racism	1
supreme	1
protester	1
racism	1
receive	1
resist	1
poverty	1
wage	1

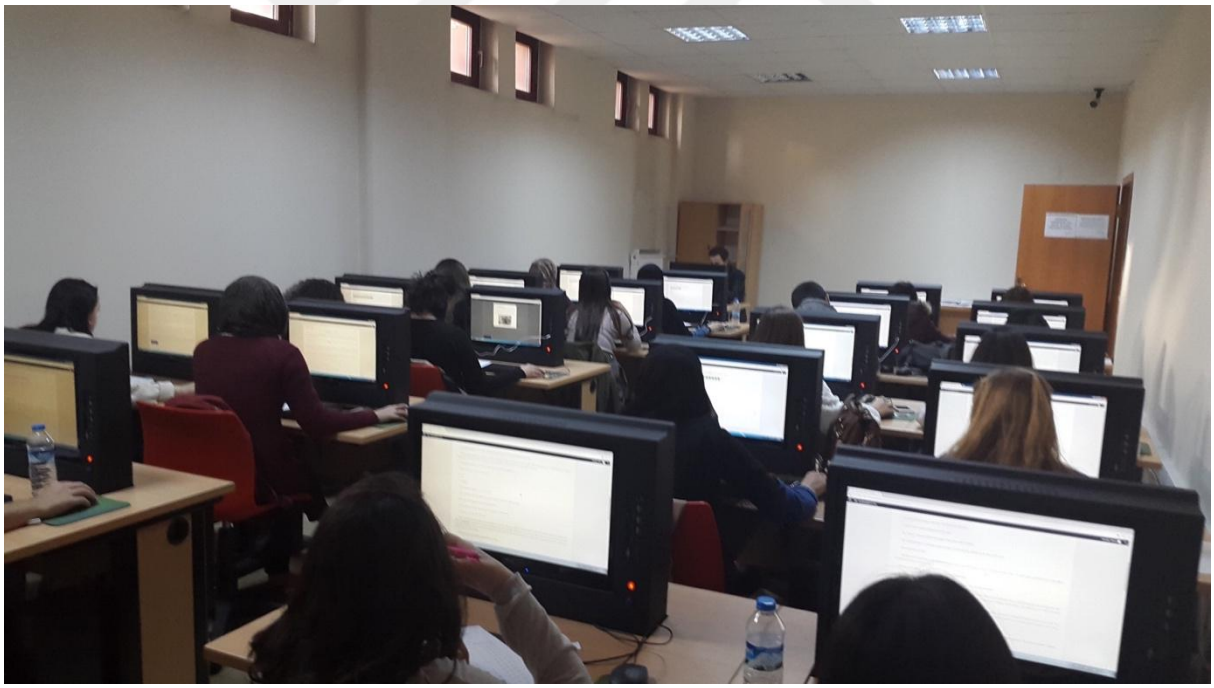
2.Text

Underlined words	The number of students
padrone	17
easel	16
gravel	16
tortoiseshell	15
crouch	14
glisten	12
clip	12
eaves	12
purr	11
drip	11
rubber	10
dignity	10
prop	10
bow	9
knot	8
dim	7
cape	7
supreme	4
swung	4
palm	4
square	4
pillow	4
shift	3
slip	3
darn	3
bench	3
kitty	3
tight	2
lap	2
monument	2
doorway	2
darn	1
momentary	1
complaint	1
path	1
neck	1

3. Text

Underlined words	The number of students
beadwork	20
adornment	19
apron	18
regalia	16
apex	14
apparel	14
triangle	12
gourd	12
merchandise	11
realm	11
mariner	10
constitute	9
fool	9
camelback	9
monopolize	9
province	8
elaborate	8
ivory	8
ware	8
fertility	6
facilitate	6
cargoe	6
interpret	5
neckband	4
clan	4
courting	4
hourglass	4
ritual	3
marital	3
throne	3
precious	3
doll	3
occupy	2
tip	2
craft	2
diamond	1
poetic	1

APPENDIX P: Photos from the study



Photos were taken while the participants were reading the texts online and accessing mediated glosses in the computer lab.

APPENDIX R: Permission to conduct the study

T.C.
ATATÜRK ÜNİVERSİTESİ REKTÖRLÜĞÜ
Kâzım Karabekir Eğitim Fakültesi Dekanlığı

Sayı : 29202147-302.08.01-E.1700275515 05.10.2017
Konu : Uygulama İzni (Eda YUCA)

REKTÖRLÜK MAKAMINA
(Öğrenci İşleri Daire Başkanlığı)

İlgi : 02.10.2017 tarihli ve 88179374-302.08.01-E.1700270780 sayılı belge.

Üniversitemiz Eğitim Bilimleri Enstitüsü Doktora Programı öğrencisi Eda YUCA'nın Yrd.Doç.Dr.Oktay YAĞIZ danışmanlığında "Çoklu Ortam Açıklamalarının Yabancı Dilde Okuduğunu Anlamak ve Kelime Öğrenmek Üzerine Etkilerinin İncelenmesi" konulu çalışmasının uygulamasını, 2017-2018 eğitim öğretim yılı 04.10.2017-15.12.2017 tarihleri arasında Fakültemiz Yabancı Diller Eğitimi Bölümü İngiliz Dili Eğitimi Anabilim Dalı 1,2,3. sınıf öğrencilerine bizzat kendisi yapması kaydıyla; ilgili bölüm başkanlığınca ve Dekanlığımızca uygun görülmüştür.

Bilgilerinizi arz ederim.

Prof.Dr. Kemal DOYMUŞ
Dekan

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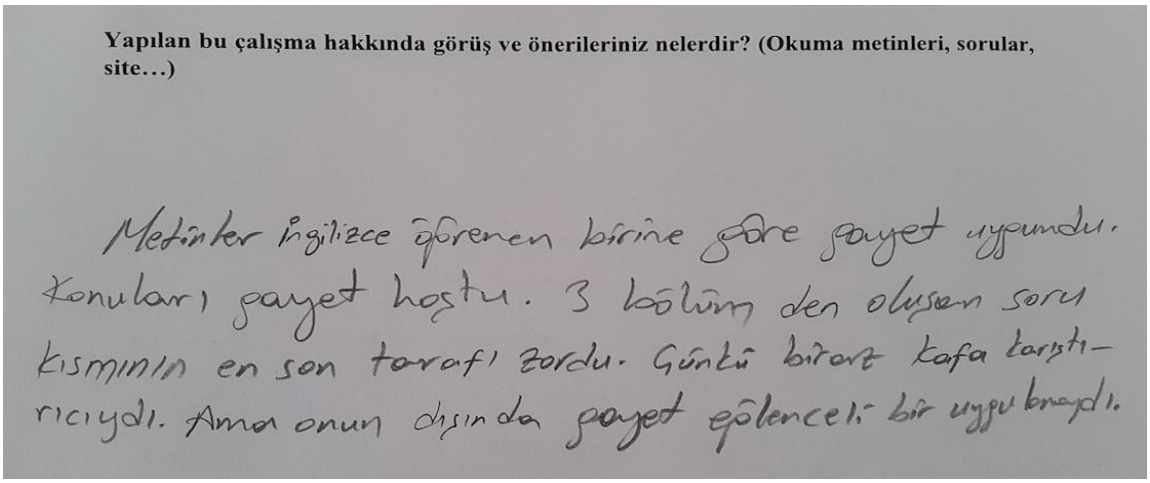
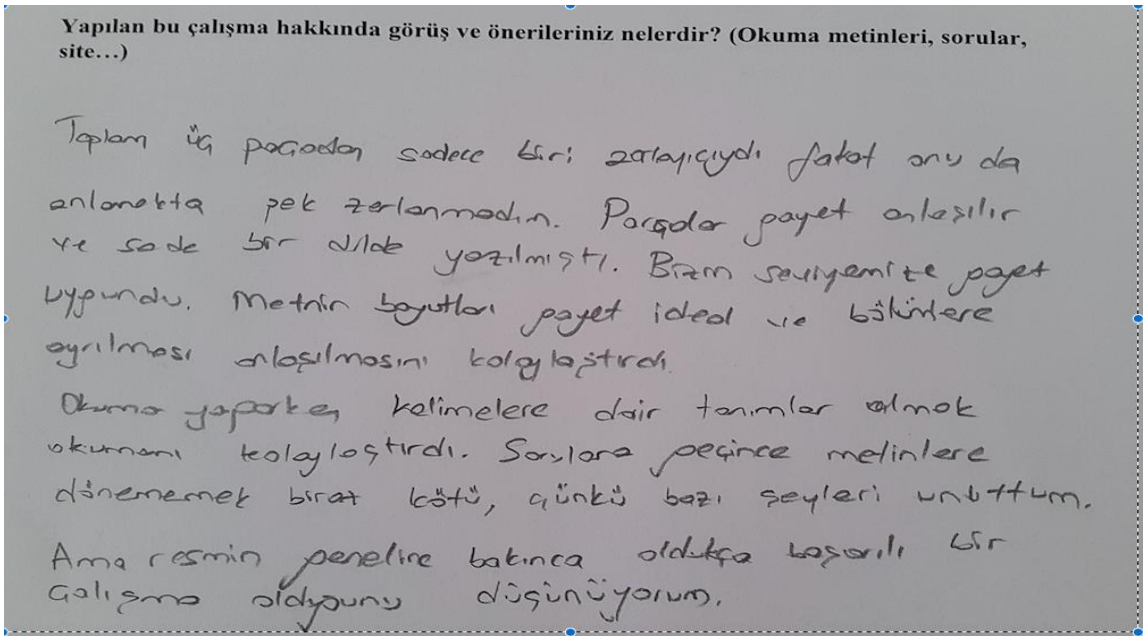
APPENDIX S: Students' responses in pilot study



Yapılan bu çalışma hakkında görüş ve önerileriniz nelerdir? (Okuma metinleri, sorular, site…)

Metinler İngilizce öğrenen birine göre gayet uygundu. Konuları gayet hoştu. 3 bölüm den oluşan soru kısmının en son tarafı zordu. Çünkü biraz kafa karıştırıcıydı. Ama onun dışında gayet eğlenceli bir uygulamaydı.

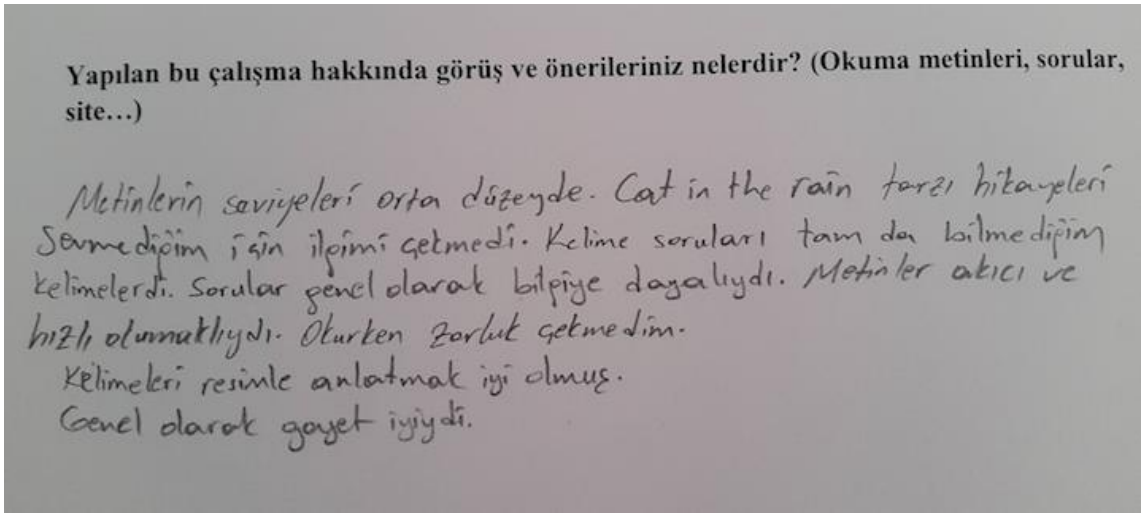


Yapılan bu çalışma hakkında görüş ve önerileriniz nelerdir? (Okuma metinleri, sorular, site…)

Toplam üç paragraftan sadece biri zorlayıcıydı fakat onu da anlamakta pek zorlanmadım. Paragraflar gayet anlaşılır ve sade bir dille yazılmıştı. Bizim seviyemizde gayet uygundu. Metnin boyutları gayet ideal ve bölümlere ayrılması anlaşılmasını kolaylaştırdı.

Okuma yaparken kelimelere dair tanımlar olmak okumamı kolaylaştırdı. Sorulara geçince metinlere dönememek biraz kötü, çünkü bazı şeyleri unuttum.

Ama resmin genelline bakınca oldukça başarılı bir çalışma olduğunu düşünüyorum.



Yapılan bu çalışma hakkında görüş ve önerileriniz nelerdir? (Okuma metinleri, sorular, site…)

Metinlerin seviyeleri orta düzeyde. Cat in the rain tarzı hikayeleri sevmediğim için ilgimi çekmedi. Kelime soruları tam da bilmediğim kelimelerdi. Sorular genel olarak bilgiye dayalıydı. Metinler akıcı ve hızlı olmaktaydı. Okurken zorluk çekmedim.

Kelimeleri resimle anlatmak iyi olmuş.

Genel olarak gayet iyiydi.

APPENDIX T: Vocabulary Checklist Results

Target words	Group A	Group B	Group C	Group D	Total
Bead (n)	0	0	0	0	0
Apparel (n)	0	0	0	0	0
Merchandise (n)	0	0	0	0	0
Mariner (n)	1	1	0	2	4
Regalia (n)	0	0	0	0	0
Adornment (n)	0	1	2	2	5
Apron (n)	1	0	1	1	3
Gourd (n)	0	0	0	0	0
Triangle (n)	3	4	4	3	11
Apex (n)	0	0	0	0	0
Easel (n)	0	0	0	0	0
Glisten (v)	0	1	0	0	1
Drip (v)	0	0	0	0	0
Gravel (n)	0	0	0	0	0
Crouch (v)	0	0	1	0	1
Eaves (n)	0	0	0	0	0
Padrone (n)	0	0	0	0	0
Clip (v)	0	3	2	2	7
Purr (v)	0	0	0	0	0
Tortoiseshell (n)	0	0	0	0	0
Indignity (n)	0	0	0	0	0
Relinquish (v)	0	0	0	0	0
Pastor (n)	0	0	0	0	0
Segregated (adj)	0	0	0	0	0
Culminate (v)	0	0	1	0	1
Desegregation (n)	0	0	0	0	0
Dub (v)	0	0	0	0	0
Bar (v)	0	0	1	0	1
Sanitary (adj)	0	0	0	0	0
Strike (n)	2	0	1	2	5
Total scores (Groups)	**7**	**10**	**13**	**12**	

CURRICULUM VITAE

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Primary-Secondary Education: Fatih Primary School- 2001

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PhD: Atatürk University, Institute of Education Sciences, FLE Department -2018

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2011- .... Muş Alparslan University – Research Assistant

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