THE EFFECTS OF HYPERMEDIA ANNOTATION TYPES AND LEARNING STYLES ON MOBILE ASSISTED VOCABULARY LEARNING , RECALL AND RETENTION

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THE EFFECTS OF HYPERMEDIA ANNOTATION TYPES AND LEARNING STYLES ON MOBILE ASSISTED VOCABULARY LEARNING , RECALL AND RETENTION

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ÖZGEÇMİŞ

1980 yılında Kadıköy- İstanbul'da doğdum. İlköğrenimimi Karamürsel Atatürk İlköğretim Okulunda tamamladım. Orta öğrenimimi 1998 yılında Karamürsel Anadolu Lisesi'nde, yüksek öğrenim lisans öğrenimimi 2002 yılında Uludağ Üniversitesi, Eğitim Fakültesi, İngilizce Öğretmenliği Bölümünde tamamladım. 2005 yılında "Coordinating Conjunction Preferences of Turkish First Year University Students" adlı tezle Uludağ Üniversitesi Sosyal Bilimler Enstitüsü İngiliz Dili Eğitimi'nde yüksek lisans derecemi ve 2018 yılında ise "The Effects of Hypermedia Annotation Types and Learning Styles on Mobile Assisted Vocabulary Learning, Recall and Retention" başlıklı tezle Yeditepe Üniversitesi Eğitim Bilimleri Enstitüsü İngiliz Dili Eğitimi alanında doktora derecemi aldım. Bu süreçte 2002-2006 yılları arasında MEB'a bağlı bir lisede İngilizce öğretmeni olarak görev yaptım. 2006 yılından beri halen Kocaeli Üniversitesi Eğitim Fakültesi Yabancı Diller Eğitimi Bölümü, İngilizce Öğretmenliği programında Öğretim Görevlisi olarak görev yapmaktayım.

Dissertation Abstract

The use of technology in education in general and on ESL teaching and learning has gained great popularity among educators and scholars as there are many educational institutions adopting these new technologies in the conventional classroom environment. Mobile phones, tablets, computers and many diverse forms of information technologies are in use in today's foreign language learning environments. It is a widespread belief that learners have different styles in getting new information in language learning and the effectiveness of teaching without taking into account of these different styles is questionable. Among many components of language learning, vocabulary attracted much attention in language learning and teaching. This study concentrated on the effects of hypermedia annotation types and different learning styles on Mobile Assisted Vocabulary Learning. It first examined hypermedia annotation preferences of EFL learners with specific reference to different learning styles during a hypermedia reading text. Second it explored the relationship between annotation use and mobile assisted vocabulary learning and retention.

Participants of the study were five tenth grade classes of a state high school. Two classes were chosen randomly as experimental group (n=49) which received Vocastyle Multimedia Vocabulary Learning Application, two classes were assigned as control group (n=48) which received paper-based annotation and the last class was assigned as pure control group (n=25) which received no annotation. Data for this study were obtained from (a) Log files which were driven from multimedia software (developed by the researcher), (b) Perceptual Learning Style Preference Questionnaire (Reid,J.,1984), (c) pretest, posttest and delayed vocabulary tests (developed by the researcher). Quantitative data analyses were done via descriptive statistics, chi-square, Manova and Kruskal-Wallis and Mann

Whitney-U. The results indicated that participants preferred video, graphic, audio and text annotations respectively. While text and audio annotations were preferred mostly by auditory learners, the number of preference for graphic and video annotations is higher among visual learners. Significant difference was found between auditory learners and visual learners in terms of accessing annotation types. According to the MANOVA analysis, there were significant differences between mean difference scores of students in each group, revealing the effect of Vocastyle Application in both vocabulary recall and retention levels of participants. These results implied that learners who used multimedia annotations recalled and retained better than the learners who used paper based annotations and who received no treatment at all. Limitations of the study were discussed and pedagogical implications with suggestions for further research were given.

Özet

Genel olarak eğitimde ve İngilizce'nin İkinci Yabancı dil olarak öğretim ve öğreniminde teknoloji kullanımı, eğitimciler ve akademisyenler arasında büyük bir popülerlik kazanmıştır. Bahsedilen bu yeni teknolojileri klasik sınıf ortamında benimseyen pek çok eğitim kurumu bulunmaktadır. Cep telefonları, tabletler, bilgisayarlar ve çok çeşitli bilgi teknolojileri bugünün yabancı dil öğrenme ortamlarında kullanılmaktadır. Öğrencilerin dil öğreniminde yeni bilgi edinme konusunda farklı öğrenme stillerine sahip oldukları ve bu farklı stilleri dikkate almadan öğretmenin etkinliği tartışılabilir olduğu yaygın bir inançtır. Dil öğreniminin pek çok bileşeni arasında, kelime öğrenimi çok ilgi görmektedir. Bu çalışma, hipermetin açıklayıcı ipucu türlerinin ve farklı öğrenme stillerinin Mobil Destekli Kelime Öğrenme üzerine etkileri üzerine yoğunlaşmıştır. İlk olarak, bir hipermetin okuma metninde farklı öğrenme stilleri dikkat edilerek İngilizce'yi yabancı dil olarak öğrenen öğrencilerin hypermetin açıklayıcı ipucu tercihlerini incelenmiştir. İkinci olarak ise açıklayıcı ipucu kullanımı ile mobil destekli kelime öğrenimi ve hatırlama arasındaki ilişkiyi araştırmıştır.

Çalışma grubunu bir devlet lisesindeki beş adet onuncu sınıf oluşturmaktadır. İki sınıf rastgele olarak Vocastyle Multimedya Kelime Öğrenim Uygulamasını kullanan deney grubu (n=49) olarak, iki sınıf kağıt üzerinde sunulan açıklayıcı ipuçlarını kullanan kontrol grubu (n=48) olarak, geride kalan son sınıf ise hiç açıklayıcı ipucu kullanmayan saf kontrol grubu (n=25) olarak seçilmiştir. Çalışmanın verileri; (a) Araştırmacı tarafından geliştirilen multimedia yazılımından elde edilen log dosyaları; (b) Algısal Öğrenme Biçimleri Tercihi Ölçeği (Reid, 1984); (c) görüşmeler; (d) araştırmacı tarafından geliştirilen başarı testinin uygulandığı öntest, sontest ve ertelenmiş sontest ile toplanmıştır. Nicel veriler betimleyici istatistikler, Kay-Kare, MANOVA, Kruskal Wallis ve Mann Whitney U testleri ile analiz

edilmiştir. Araştırma sonucunda katılımcıların sırasıyla video, grafik, ses ve metin açıklayıcı ipuçlarını tercih ettiklerini ortaya koymuştur. Metin ve ses ipuçları daha çok işitsel öğreniciler tarafından tercih edilirken, grafik ve video ipuçlarını tercih edenlerin sayısı görsel öğreniciler arasında daha fazladır. Görsel ve işitsel öğreniciler arasında, açıklayıcı ipuçlarını kullanma açısından anlamlı farklılık bulunmuştur. MANOVA analizi sonuçlarına göre her üç gruptaki öğrencilerin fark ortalamaları arasında anlamlı farklılıklar bulunmaktadır. Bu durum Vocastyle Uygulaması'nın katılımcıların kelime öğrenimi ve hatırlanması üzerindeki etkisini ortaya çıkarmaktadır. MANOVA analizi sonuçlarına göre multimedya açıklayıcı ipuçlarını kullanan öğrencilerin kelimeleri, kağıt üzerinde sunulan ipuçlarıyla öğrenenlere ve hiç ipucu kullanmadan öğrenenlere göre daha iyi öğrendiğini ve hatırladığını ortaya koymuştur. Araştırmanın sınırlılıkları tartışılmış, pedagojik öneriler ile ileriki araştırmalar için öneriler sunulmuştur.

DEDICATION

To my first teachers, Emine Gürkan & Kemal Gürkan & Sevil Gürkan, my family, who are my first teachers in my small world.

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CHAPTER 1: INTRODUCTION

1.1 The Background of the Study

The student profile of today's gradually developing society has evolved according to the necessities of globalization and improvements in almost every facets of science and technology. Along with this changing profile, in the current era, the amount of information that students are exposed to is increasing rapidly as well as getting the information in a number of discrete ways. In this vein, education systems not only should be improved to meet today's needs but also should concentrate on both current and possible future needs of students. Traditional methods of teaching and learning should be updated to lifelong and unlimited education since they fail to meet what modern society needs. As a result of rapid changes in information and technologies it is inevitable for education to be affected. With the emergence of lifelong learning and the need of incorporating technology into education systems and learning environments, instructional materials, methods, techniques used in such environments have been altered to more contemporary and technology aided versions. Use of technology in education has been included and adapted to almost all of the fields so far and language learning and teaching is one of those popular ones.

The use of technology in education in general and on English as a Second Language (ESL) and English as a Foreign Language (EFL) learning has gained great popularity among educators and scholars as there are many educational institutions adopting these new technologies in the conventional classroom environment. Mobile phones, tablets, computers and many diverse forms of information technologies are in use in today's language learning environments.

As well as the commonly accepted role of technology in language learning environments as an effective tool, the place of learning styles, on the other hand, is of

crucial importance not only in just any form of learning but also in language learning. Learning styles are as preferred ways of learning unconsciously and it differs from one learner to other. They are students' approaches during learning something new or to cope up with a new problematic educational situation (Oxford, Ehrman, & Lavine, 1991). They are also defined as differences among students in the use of various senses to comprehend, organize and retain experience (Reid, 1987). Thus, it is reasonable to comment that learners have different styles in getting new information in language learning and the effectiveness of teaching without taking into account of the existence of these different learning styles is questionable.

Among many components of language learning as learning styles, vocabulary and reading also have attracted much attention by researchers lately. Vocabulary learning is an indispensable part of learning a new language (Nation, 2001). Much vocabulary might be learnt incidentally through reading (Nagy, 1997). Tassana-ngam (2004) states that vocabulary is quite influential on reading skill. It might facilitate particularly comprehension of second language learners' on a written text on the condition that the learners' vocabulary knowledge is lower or below the threshold minimum of approximately 3,000 words. Reading "large quantities of materials that is within learners' linguistic competence" (Grabe & Stroller, 2002, p. 259), facilitates vocabulary learning by providing chances for inferring word meaning in context (Krashen, 2003).

Nevertheless, learning vocabulary is as important as retaining and retrieving. Many learners generally find it hard to remember the words they have studied before. Yet learning occurs when a learner is able to recall a previously studied vocabulary. Thornbury (2002) states that remembering what has been studied is the keypoint for a vocabulary to be learnt. So the main question needs to be asked is what should be done to attain a better

vocabulary recall and retention level? As a reasonable response to the existing problem, Craik and Lockhart (1972) suggested depth of processing theory which claims that the retention of a word successfully relies heavily on how deeply it is processed at sensory level. Accordingly, it can be put forward that in order to have more permanent memory relations you need to process in the deeper level. To attain better recall results for words in the long term memory; it is necessary to use the given information in a sentence or in a context so as the definition could be noticed. Craik and Tulving (1975) claims that good retention depends on attention to the word's meaning. Craik and Lockhart (1972) also state that storing information in the long term memory does not rely on the time period it is kept in short term memory yet is linked with how deeply it is processed. Another support for recall and retention of vocabulary comes from Laufer and Hulstijn's (2001) the"task induced involvement load model. This model depends on the depth of processing model and was applied to the second language context afterwards. According to this model, "Involvement is perceived as a motivator-cognitive construct which can explain and predict learners' success in the retention of hitherto unfamiliar words." (Laufer and Hulstijn, 2001, p. 14). The notion of involvement has three factors which are need, search and evaluation.

The motivational construct of need is concerned with one's will to achieve whether the imposition by the task is from external agents or inner sources. The external imposition may refer to times when the learner is asked by the instructor to use a vocabulary item in a sentence. Laufer and Hulstijn (2001) call this a moderate need. Nation (2001, p. 71) puts it as: "Need is moderate if the task requires the target vocabulary. The other two components of the concept of involvement are search and evaluation which are both cognitive aspects.

According to Laufer and Hulstijn (2001, p.14) “Search is the attempt to find the meaning of an unknown L2 word or trying to find the L2 word from expressing a concept (e.g., trying to find the L2 translation of an L1 word) by consulting a dictionary or another authority (e.g., a teacher).” According to this description, if the meaning of a word is supplied in the task then there is no search (Laufer & Hulstijn, 2001; Nation, 2001).

Evaluation on the other hand, refers to the assessment of an appropriate meaning or use of a given word within the suitable context. Simply the component of evaluation implies “a comparison of a given word with other words, a specific meaning of a word with its other meanings, or combining the word with other words in order to assess whether a word (i.e., a form-meaning pair) does or does not fit its context”. For instance, in a reading task in which an L2 word looked up has multiple meanings, the choice of the most appropriate meaning should be achieved by comparing all the meanings against the context. The component of evaluation has two degrees of prominence: When evaluation requires the use of a new word within a given sentence, it is moderate, but when the learners are required to produce an original sentence, evaluation is strong because learners should judge how to combine words and produce a sentence.

While the theory and the model above accounts for better vocabulary recall and retention outcomes Laufer (2006, p. 152) claims that “learners do not necessarily notice unfamiliar words in the input” so an explicit and discrete learning might be profitable for increasing word knowledge depth, expanding the size of vocabulary and facilitating enriched use of Lexis. Thus, the use of annotations might be an alternative strategy to make the input more explicit.

1.2. Statement of the Problem

There have been many studies revealing strong relationship between reading and vocabulary development (Gettys, Imhof & Kautz, 2001; Cobb, 2007; Brown, Waring, Dankaewbua, 2008; Kweon & Kim, 2008). Much of the vocabulary might be learned through reading incidentally, yet reading alone may not be sufficient all the time to extract necessary lexical information from the text. Mobile assisted language learning techniques might provide solutions to the problem and using annotations is believed to be an influential technique for vocabulary development. Previous research on annotations yield controversial findings regarding the effectiveness of annotations and which annotation types are more effective (Wesche & Paribakht, 1996; Laufer & Hulstijn, 2001; Nation, 2001; Rott, Williams, and Cameron, 2002). Nation (2001), Wesche and Paribakht (1996) Rott, Williams, and Cameron (2002) examined the impact of annotations for incidental vocabulary learning for printed materials and revealed findings indicating vocabulary enhancement. On the other hand, Laufer and Hulstijn (2001) thought that using annotations was not an influential way of enhancing vocabulary learning. Most of the studies have been carried out through computerized conditions but there have been no studies concentrating on the relationship between the use of multimedia annotation types (text, pictures, audio, and video) and different learning styles and its effects on Mobile Assisted Vocabulary Learning (MAVL).

1.3. Purpose of the Study

This dissertation concentrated on the effects of multimedia annotation types and different learning styles on Mobile Assisted Vocabulary Learning. In other words, it first examined multimedia annotation preferences of EFL learners with specific reference to diverse learning preferences during reading hypermedia texts. Second, it explored the use

of multimedia annotation types (text, pictures, audio, and video) and different learning styles (auditory learners and visual learners) and its effects on Mobile Assisted Vocabulary Learning (MAVL).

1.4. Research Questions

Accordingly, this study explored two main issues regarding Mobile Assisted Vocabulary Learning (MAVL) in hypermedia reading environment: the annotation preferences (text, pictures/graphics, audio, and video) of English as a foreign language (EFL) learners with different learning styles when they are engaged in a MAVL environment; and (b) the effect of annotation use on Mobile Assisted Vocabulary Learning, Recall and Retention.

Based on the issues above the research questions are as follows:

1. What are the annotation preferences (text, pictures/graphics, audio, and video) of English as a foreign language (EFL) learners with different learning styles when they are engaged in a MAVL environment?,

1.a. What are the annotation preferences (text, pictures/graphics, audio, and video) of EFL learners when they are involved in a hypermedia reading text?

1.b. What are the perceptual learning styles of EFL learners when they are involved in a hypermedia reading text?

1.c. Is there a relationship between EFL learners' perceptual learning styles (visual and auditory) and annotation preferences (text, pictures/graphics, audio, and video) ?

2. Is there a significant difference among three groups, with multimedia annotation, with paper based annotation and with no annotation, in terms of vocabulary learning and retention? If so, what particular types of annotations do affect vocabulary achievement of target words?

2.a Is there a significant difference among three groups (High, Mid, Low annotation users) in terms of immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment?

2.b. Is there a significant difference among three groups (High, Mid, Low annotation users) in terms of vocabulary retention under Mobile Assisted Vocabulary Learning environment?

1.5 Significance of the Study

The study is important in terms of providing pedagogical implications which might be useful for the profitability and endurance of Fatih Project, which has been piloted in 57 schools in 17 provinces in Turkey. The projects seeks to integrate traditional instructional materials with today's technology by integrating course contents into tablets delivered to each students on different grade levels. Like every new project, this project is not free of problems and is subject to many criticisms ranging from low quality hardware to insufficient amount of instructional e-contents. From an educational perspective our focus will be on designing and managing educational e-content which has been regarded as one of the most problematic sides of the project since e-contents have been regarded insufficient in meeting the needs of the course requirements. There is a widespread belief that the number of well quality educational e-contents supplementing coursebooks are scarce. Even though there is a website for the management system of e-content (www.eba.gov.tr), teachers and students have been complaining about the insufficiencies of the e-contents related to courses. Many educators agree that rich and qualified e-content which would meet the necessities of related courses should be prepared, designed and uploaded as soon as possible for both teachers and students. Otherwise the profitability of the Project will remain questioned.

In the light of the problems raised above the researcher developed a mobile vocabulary learning application, with multimedia annotation techniques (text, pictures/graphics, audio, and video), which is compatible with tablets of the students and teachers. It is believed that with the design of the application, a supplementary e-material, will be generated to facilitate vocabulary learning of 10^{th} grade level students.

1.6. Operational Definitions of the Terms Used in the Study

Some of the key concepts included in the study are defined below.

Mobil e-learning (m-learning): The delivery of a learning, training or education program by electronic means

Mobile-Assisted Language Learning: is a type of learning that is assisted or enhanced through the use of a handheld mobile device

Incidental vocabulary learning: the process of learning something without the intention of doing so.

Learning Style: Learning style is the attitude, favorites, and conducts that learners utilize in their learning.

Perceptual Learning Style: this type of learning style is related to the ways we receive new information. These ways are visual (videos, pictures etc.), auditory (audio files) and hands-on. Hands-on style is generally regarded as kinaesthetic.

Multimedia: Materials such as texts, pictures, videos displayed by computer-based applications.

Hypertext: It is referred to as a complex system of designing and accessing texts which are not linear. It is also used as a bridge between multimedia and hypermedia.

Hypermedia: It is a term used for computer-based applications which blends hypertext and multimedia.

Annotation/Gloss: A gloss is “a brief definition or synonym, either in L1 or L2, which is provided with the text” (Nation,2013).

Multimedia annotation/gloss: It is an interactive multimedia gloss including hyperlinks to provide multimodal information through pictures, sounds, videos.

Textual annotation: It is a text based gloss including a brief definition or synonym, either in L1 or L2, which is provided with the text.

Pictorial annotation: It is a gloss including a picture regarding the target word.

Video annotation: It is a gloss including a video explaining the target word.

Audio annotation: It is a gloss including a audio explaining the target word.

CHAPTER 2

REVIEW OF THE LITERATURE

2.1. Mobile Learning

Along with the development of mobile devices in technology world, mobile learning has gained much popularity recently. This progress in mobile technology made people carry their own personal computers such as tablets, mobile phones and e-book readers. This huge portable computing power, integrated with wireless communication, enabled learners not to be restricted with conventional classrooms and can make use of digital learning environment regardless of time and place (Hwang & Tsai, 2011). Being as a flexible learning process, mobile learning has been defined in various ways so far. Yui, Liu and Wai (2005) defined mobile learning as a flexible environment which is accessible anywhere, anytime and which has a worldwide support for communication. Frohberg, Goth and Schwabe (2009) also remarked that independence from time and place can expand the horizons and scope of learning with the belief that mobile learning might be considered as an extension of online learning. Cheung and Slavin (2013) also highlighted the portability and accessibility of mobile learning claiming that with integrated digital content learners can access learning activities no matter where they are and whenever they want. Klopfer, Sheldon, Perry and Chen (2012) claimed that this great change in learning environments was due to 5 characteristics of mobile devices. These are: connectivity, social interactivity, context sensitivity, portability and individuality. Connectivity denotes that mobile devices can be connected to each other therefore can share information via networks. Social interactivity means learners can link to each other socially and share their information with ease. Context sensitivity represents that localized information can be acquired. Portability stands for transportability of mobile devices and, individuality implies that learners can

reach information at their own pace. These characteristics might be useful in enhancing the impact of a number of pedagogies, such as self-directed learning, inquiry learning. Nevertheless, it should be noted that mobile devices are not solely adequate enough to supply all necessary conditions to get positive learning effects (Sung, Chang & Liu, 2016). They may have possible pros for language learning, yet they should be approached cautiously, which might generate cons as well, such as supplying some distracting contents and / or suggesting redundant materials throughout learning process (Gauerdau, Miranda & Gareau, 2014). Therefore, instructional strategies are crucial to have the key role in integrating mobile devices with related pedagogical challenges (Liu, Lin & Paas, 2014).

Within the scope of mobile learning, there have been many studies on the use of mobile technology in education. Hwang and Tsai (2011) supplied a broad review on studies towards mobile and ubiquitous learning published in six journals between 2001 and 2010. In their review, they figured out that studies on this issue have considerably and incrementally increased in since 2008. They remarked that researchers mostly focused on tertiary level and fields like language arts, engineering, and computer technology. Frohberg, Goth, and Schwabe (2009) classified 102 mobile projects on learning and noticed that most activities of mobile learning happened across diverse environments, and occurred in places such as classrooms and workplaces. Considering the instructional roles of mobile devices in educational environments, these devices have mostly been regarded, firstly, as stimulative and motivational tools rather than content-carrying digital tools. The number of projects which have used mobile devices to aid constructive thinking or reflection is not much. Moreover, a great number of mobile learning activities have been under the control of teachers and only a few of them have placed the learner to the point of attention. From the perspective of communicative functions, projects having used

cooperative or team communication have been scarce. Furthermore, a great deal of studies have been conducted on inexperienced participants. In terms of educational goals, it was noted that most of the studies paid oriented on lower-level knowledge and skills neglecting higher-level tasks like analysis and evaluation (Hwang and Tsai, 2011).

2.1.1.Learning Theories Related to Mobile-Learning

There have been many mobile learning theories in the literature. Each theory focuses on diverse features such as individualism, mobile technologies, mobility and e-learning. Today's mobile learning theories are Cognitivism, Constructivism, Problem-Based Learning, Collaborative Learning, Conversational Learning, Behaviorism, Context Awareness Learning, Lifelong Learning, Situated Learning, Socio-Cultural Theory, Informal Learning, Connectivism, Activity Theory, Navigationism and Location-based learning (Keskin and Metcalf, 2011). Although there have been many diverse theories discussed in the literature, this study focuses on Cognitivism which postulates that acquisition and reorganization of cognitive structures have a pivotal role in the learning by which information is processed and stored by humans (Good and Brophy,1990). In terms of mobile learning environments, Dual Code and Cognitive Load Theories are in line with Cognitivism. While Dual Coding Theory (DCT) (Paivio, 1990) claims the idea of pictorial-verbal system for knowledge construction in which a verbal system deals directly with language and a nonverbal (pictorial) system deals with non-linguistic objects, elements, and events, Cognitive Load Theory, on the other hand, argues that that cognitive capacity in working memory is restricted, so that if a learning task requires too much capacity, learning will be obstructed on the condition that a learning necessitates too much capacity. Designing instructional systems optimizing the use of working memory capacity and avoiding cognitive overload might work as a remedial strategy.

In addition to the theories above, Generative Theory of Multimedia Learning (Mayer, 2001) puts forward that both verbal and nonverbal information is accessed consecutively in short-term memory. Then the working memory comes into play as the place where the information is processed with both verbal and visual representations to get a holistic form leading to a more complete understanding of the information. Generally, when language learners are offered both verbal and visual input via multimedia, they choose and arrange helpful information accordingly into different models. Thus, the relationships can be established to construct a kind of structure which is mental and meaningful. In fact, linguistic elements, specifically words, in verbal models offer discrete and linear information, but a holistic and nonlinear type of information is offered by pictures in other models. Therefore, learners can have better comprehension when they incorporate knowledge structures into the related models (Ariew, 2006).

This study concentrates on the effects of multimedia annotation types and different learning styles on Mobile Assisted Vocabulary Learning. In other words, it first examines multimedia annotation preferences of EFL learners with specific reference to diverse learning preferences during reading hypermedia texts. Second, it will explore the use of multimedia annotation types (text, pictures, audio, and video) and different learning styles and its effects on Mobile Assisted Vocabulary Learning (MAVL). Therefore, among the learning theories related to mobile technology above, this study is parallel with Cognitivism, Dual Coding Theory and Generative Theory of multimedia learning, as a number of different annotations are given to learners via a mobile application. The information is coded dually or multiply and verbal, pictorial and/or aural systems are activated accordingly.

2.1.2. Mobile-Assisted Language Learning

Recently, a large body of studies has been carried out to find out an alternative way to substitute computer assisted language learning. The invention of wireless technology and the development in mobile technology world have gained much popularity in education field. Mobile devices include features of connectivity, social interactivity, context sensitivity, portability and individuality which personal computers may not do (Klopfer, Sheldon, Perry & Chen, 2012). Mobile devices have transformed the way we learn and expanded our horizons by making learning learning portable, real-time, cooperative (Kukulska-Hulme, 2009; Wong & Looi, 2011). In the light of these developments and the increasing attention Mobile-Assisted Language Learning (MALL), a great number of studies have been done to examine the possible effects of mobile technologies on language learning. One of these studies was conducted by Kukulska-Hulme (2010). In the study, Kukulska-Hulme (2010) emphasizes that mobile technologies provide learners with new tools to communicate and collaborate with each other by supplying lectures, tutorials and activities after the lesson, all of which reinforces learners during language learning process. Another study about mobile assisted language learning was conducted by Kim (2011). In this study, the effect of SMS text messaging on vocabulary learning was examined. Kim (2011) found out that students that used SMS text messaging after classes improved their vocabulary knowledge more by learning more words, and students gave positive feedback on using SMS text messaging for learning new vocabulary items. Kim (2011) emphasized that the reason for this improvement and positive feedback was interactivity in using new words.

Some of the other studies that examine impact of mobile technologies on language learning process were about vocabulary learning via PDAs (Song & Fox, 2008), language

skills such as L2 writing via mobile phones (Li & Hegelheimer, 2013), L2 reading via PDAs (Chang & Hsu, 2011), pronunciation practice (Saran, Seferoğlu, & Çağıltay, 2009), a learner-generated vocabulary content in an authentic environment (Wong and Looi, 2010; Hasegawa, Ishikawa, Shinagawa, Kaneko & Mikakoda, 2008), the comparison of e-dictionaries and paper dictionaries in terms of reading comprehension and vocabulary retention (Koyama & Takeuchi, 2004), exercises on spelling and pronunciation activities with the help of mobile phones (Butgereit, Botha, van Niekerk, 2009; Saran, Seferoğlu, & Çağıltay, 2009; Zhang, 2012), learning idioms with the help of mobile phones (Amer, 2010), and the affective role of mobile phones in language learning (Clarke, Keing, Lam, & McNaught, 2008; Çavuş & İbrahim, 2009; Kennedy & Levy, 2008). Besides these, similar to Kim's (2011) study, there were some studies on the use of SMS for learning collocations (Motallebzadeh, Beh-Afarin, & Daliry Rad, 2011), the effectiveness of vocabulary learning through SMS when compared to vocabulary learning through traditional flashcards (Başoğlu & Akdemir, 2010; Azabdaftari & Mozaheb, 2012), and the effect of using SMS on vocabulary learning when compared to using printed dictionary (Alemi, Sarab, & Lari, 2012).

Al-Jarf (2012) explored the effects of using self-study MP3 L2 English lessons (TalkEnglish) on oral skill development of 90 university students enrolled at a state university in Saudi Arabia. The students were randomly assigned as a control group (44 students) and an experimental group of 46 students. While experimental group were exposed to TalkEnglish for 12 weeks, control group only received traditional instruction. The software could be run via mobile phones, MP3 players and/ or computers. The findings indicated that students in experimental group showed better performances during the controls in both listening and speaking skills.

Amer (2010) examined the effect of using a mobile application on learning idiomatic expressions and collocations. 45 L2 English university students participated in the study. They were asked to use a mobile app (idiomobile) which contains a game and quizzes in it. The application also allowed the customization for better learning outcomes. The application was piloted on mobile phones for a week with a 7-14 hours of average use. It was found that the students using the app scored higher in the quizzes. All learners remarked that app was useful in learning idioms and collocations.

Baleghizadeh and Oladrostam (2010) concentrated on the effect of using mobile phones to record L2 English class discussions intended to elicit grammatical forms under review. 20 students out of 6 classes from an Iranian university were asked to record their speech over their mobile phones and then they were requested to analyze their spoken mistakes as an out of class judgement till the following class. 20 students in control group did receive regular training. Findings revealed Experimental group students significantly displayed better grammatical accuracy than their control group counterparts.

Gabarre and Gabarre (2009) examined using mobile phones to foster communicative writing and speaking skills in the L2 French of university students. The study lasted two weeks. At first, 18 participants used their mobile phones to take pictures on campus. Pictures were supposed to be accompanied by a written commentary. Then, 22 students made recordings of a simulated dialogue. Student recordings were sent via MMS to an online class forum. Students had a chance see and comment each other's work by writing and with audio recordings in the forum. The findings indicated that the use of mobile phones fostered communicative writing and speaking skills.

Hoven and Palalas (2011) concentrated on the mobile-assisted component of an English for Specific Purposes course that focused on listening and speaking skills in a

Canadian college. Twelve L2 English college students participated to the study for 15 weeks. The program use web-access MP4 players to deliver 2-8 mins workplace audio/video podcasts as well as accessing to a class blog which is online. It was found out that student had positive attitudes towards using the mobile resources and displayed higher listening and speaking performances.

Chen and Chang (2011) explored the moderating effect of L2 English proficiency upon presentation mode. 162 students from a Taiwanese university participated to the study. They used a PDA-based vocabulary learning program, and they used it for 2 weeks. The participants were randomly divided into 2 groups. Half of the group were allowed to use audio only and the other students were given both audio and text. The findings yielded that there was no moderating effect since student having dual mode scored performed better than the students who had access only to audio across proficiency levels.

Kessler (2010) conducted a study on the effect of using MP3 players compared to audio lab PCs upon speaking quality. The sample of the study consisted of 40 students. They were requested to record a two minute audio journal during ten weeks. Thirty-eight students made 8 of 10 recordings with their mobile device. Speaking fluency of students was rated in terms of volume, pausing, utterance length, and rate. In all terms students using MP3 players performed better than those who used audio lab.

Admitting it as a growing field of study in language learning, more studies are needed to uncover the large amount information and question marks in MALL technology. What is more the effectiveness of different mobile devices on providing a more fruitful learning environment should be sought. With mobile technology, learners may feel free of time and place enjoying the advantage of learning something regardless of where they are. By this way, the need to learn a foreign language via formal instruction in classroom

environment with a teacher decreases as MALL gains much attention from busy learners. Put it differently, MALL may serve as a reasonable solution to barriers of language learning such as time and place.

MALL can be evaluated as beneficial for all learners, since almost every L2 learner has a mobile device today, and as a result of this mobile devices may offer equal opportunities to L2 learners. Having these in mind, it is possible to say that mobile activities should be improved to cover four language skills, grammar, pronunciation and especially vocabulary learning, which is a "key to foreign language learning" (Masshady, Lotfi & Noura, 2012).

2.2. L2 Vocabulary Learning

English as foreign language learners who experience an unnatural environment can have a good mastery in English. Yet, they might have problems in comprehending the written texts and utterances of the other speakers of language both native and non-native (Nation, 1993). It would be reasonable to assume that their hurdle might be their limited active and passive vocabulary. These learners are exposed to the target language mostly in traditional classroom settings in which they follow a pre-designed curriculum heavily depending on coursebooks generated by native English speakers. The majority of these students have limited natural exposure to target language and little chance to practice it out of the classroom environment limiting their ability to interact with other language users (Laufer, 2003). There is a growing body of research that support the assumption that vocabulary skills have a vital role in contributing most aspects of L2 proficiency (Meara, 1996). Nevertheless, grammar based instruction is prior in most of the target language environments and leaving a minor focus to vocabulary learning (Harwood, 2002). One the causes of this might be the view that learners can get vocabulary by themselves without the

existence of an explicit strategy and they can guesstimate and infer the meaning out of the context (Conzett, 2000). Along with the increasing number of studies towards vocabulary teaching and learning, vocabulary research has gained much popularity (Mondrea & Wiersma, 2004). It was also argued that interest to second language vocabulary acquisition has been increasing rapidly among researchers, instructors, curriculum designers and theoreticians (Shen, 2008). Most of these researchers believe that vocabulary teaching is one of the most important part of language learning yet in a closer look to the classroom practices the allotted time for vocabulary teaching is highly restricted covering only the target words which are pre-planned in the coursebook. Thus, the responsibility of English language teachers is very high in terms of building vocabulary of learners by making students' practical and academic needs in L2 use clear.

2.2.1. Intentional and Incidental Vocabulary Learning

While intentional vocabulary learning stands for intended actions of students toward learning new words and associated with more natural language learning, incidental vocabulary learning, on the other hand, refers to having no intention in acquiring new words through context. In the former one learners might study target word lists and do exercises on printed material etc. the latter one includes learners picking up new words during free reading. Cobb (2007), however, claims that free reading cannot supply sufficient chances for acquiring vocabulary without the assistance of computerized settings. Yet much vocabulary might not be learned solely either by incidental or intentional types. Diverse types of vocabulary learning can complement each other forming a continuum among intentional and incidental vocabulary learning (Coady, 1997) since attention is not a conflicting entity (Wesche & Paribakht, 1999; Barcroft, 2004). There are many different instruction techniques for vocabulary learning ranging from

indirect to direct (Wesche & Paribakht, 1999). While reading a text to get meaning requires some conscious attention to new words can be regarded as neither solely indirect nor only direct. On the other hand it is also not easy to label it as intentional or incidental when a list of unknown words is read in a communicative context.

Hulstijn (2001) described incidental vocabulary learning as a product of any reading, listening, speaking or writing activities that do not focus on learning new vocabulary items; and intentional vocabulary learning as a product of activities aim of which is to teach new lexical information to learners' memory. Thus, it can be said that incidental vocabulary learning happens through unconscious processes, while intentional vocabulary learning is a more conscious process. Ellis (1994) describes two different types of attention in order to differentiate between intentional and incidental vocabulary learning. These types of attention are focal and peripheral attentions. Ellis (1994) emphasized while *focal attention* is required for intentional learning in order to concentrate on linguistic codes, *peripheral attention* is directed at form during incidental learning, focus of which is on meaning.

Hulstijn (2001) emphasized that there are some conflicts between linguists in terms of L2 vocabulary learning processes. Some researchers argued that learners could learn new vocabulary items through reading, listening, speaking or writing activities only with the help of conscious attention to learn them (Carter, McCarthy, Channell & McCarthy, 1988; Ellis & Sinclair, 1989; Oxford & Crookall, 1989; Lewis, 1993; Sökmen, 1997). Similarly Bruton, López and Mesa (2011) argued that incidental vocabulary learning is an impracticable term due to the fact that L2 learning generally occurs on instructed environment, which includes textbooks, curricula or syllabi. On the other hand, Krashen (1989) emphasized that learners can obtain new vocabulary items through extensive

reading and listening activities, and discouraged using activities that focuses on intentional vocabulary learning.

Among the L2 intentional or incidental learning dichotomy most of the references are closely related to vocabulary (Hulstijn, 2003). Accordingly, a great deal of researchers believe that vocabulary is learned as an indirect outcome of other activities such as reading comprehension (Kweon & Kim, 2008; Laufer & Hill, 2000; Brown, Waring, & Donkaewbua, 2008) and at the times where there is no purposeful intention for learning vocabulary (Barcroft, 2004; Brown et al., 2008; Yoshii & Flaitz, 2002).

2.2.2.Word Knowledge

Velasco (2007) defines the basic dimension of word knowledge as size. According to him learners with great amount of vocabulary size are believed to be more proficient in wide range of language skills. Those learners feel themselves more secure and relaxed while using target language. Nevertheless, determining the number of words that an L2 learner must know is not that certain. Another definition of word knowledge (Nation, 2001) claims that you should know what is included in knowing a word. In terms of vocabulary teaching this is called learning burden of a word. Accordingly he believes that learning burden of a word involves form, meaning and use of a word.

2.2.2.1. Form, Meaning, Use

There are three types of a word form. These are spoken form, written form and word parts. While the spoken form refers to accurate reproduction of the target words written form refers to writing the target word correctly and word parts is related to knowing the root and affixes of a word like free root, bound root, derivational and inflectional affixes.

In terms of meaning there is a word can be categorized as form and meaning, concept and referents, and finally associations. While the first one tries to seek answer to find out whether the word is a loan word in the mother language, concepts and referents look for whether there is an L1 word almost with the same meaning (e.g. cognates). Finally, associations look for whether there are L1 words of similar meaning with the target words which fit into the same sets.

The last part of word types connotes to use as grammatical functions, collocations and constraints on use. Grammatical functions seek whether there are predictable grammar patterns in which the word fits. Collocations, on the other hand, try to figure out whether the word has similar collocations in L1 and constraints on use seeks to find out whether the word have identical restrictions on its use.

2.2.3. Annotation

Hypermedia texts are generally credited in a nonlinear manner rather than linear because information is presented via links or nodes in the form of different types of annotations which aid readers to comprehend the text better. Annotations are regarded to be practical in reading in the second language; words or phrases that are not familiar with the learners' actual competence may be provided through annotations (Widdowson, 1984). Therefore, it is possible to make a given text comprehensible for L2 readers without any decrease in its authenticity.

There have been debates about whether paper-based glosses or multimedia glosses including annotations are more effective in vocabulary learning and reading comprehension. Paper-based glosses are defined as emphasizing glossed words by underlining them in the text and presenting their definitions in learners' L1 in the same page (Bowles, 2004). Several studies on input enhancement investigated the effect of

printed glosses demonstrated that glosses can facilitate reading comprehension (e.g., Davis, 1989; Jacobs, Dufon & Fong, 1994). Davis (1989) and Jacobs et al. (1994) found that glosses enable students recall more words when compared to students who read the same text on an unannotated text.

With input enhancement with computers' becoming technologically feasible on vocabulary learning and reading comprehension as technology's integration into teaching has accelerated and CALL's being implemented both in and outside formal classroom environments, multimedia glosses have gained more attention. Because different types of media might be employed by annotations which is not available in traditional ones, some studies were conducted in order to understand whether paper-based glosses are multimedia glosses are more effective (Bowles, 2004; Taylor, 2009). Taylor (2009) found that multimedia glosses are more effective since these glosses provide more glossed vocabulary items, they are less distractive, and they give responsibility to learners because learners selectively consult multimedia glosses.

Multimedia glosses, on the other hand, are computerized texts can be related to the targeted word in diverse forms and can be displayed at anywhere on the screen when the word is clicked. Different from paper-based glosses, multimedia glosses not only provide textual information but also can be in numerous modalities such as visual (text, video and picture), audio (sound) to offer vocabulary information (Beach, Hull & O'Brien, 2011). A number of different modalities can be profited in multimedia glosses such as a hybrid form of texts and pictures (Yanguas, 2009), textual gloss with videos (Al-Seghayer, 2001), textual glosses in combination with audio (Chun & Plass, 1996), or pictures, texts and audios altogether (Salem, 2006)

Based on the debate above, Roby (1999) categorizes annotations under certain groups depending on their language, purpose, focus, form, function and author. The details for each group are given below (Roby, 1999, p.96).

Roby's Taxonomy of Annotations

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.Extratextual

V.Gloss Language
- A. L1
- B. L2
- C. L3

VI. Gloss Form
- A. Verbal
- B. Visual
  - 1.Image
  - 2.Icon
  - 3.Video
    - a.with sound
    - b.without sound
- C.Audio (only)

As it is clear from the taxonomy, annotations offer more chances to learners to comprehend difficult words or phrases. They might emphasize important points or make them clear besides providing lexical, syntactic, or background information.

Based on his fist draft taxonomy, Roby further added annotation configurations such as annotation presentation and annotation density. While the former relates to how the information should be displayed the latter is regarded with how much annotation should be done. Another configuration concern was raised by Chun and Plass (1996). They state that the location of annotations, within the body of the text (internal) or outside the text (external) does also matter. Chun and Plass (1996) also remarks that internal annotations contribute to the process how learners read in reading.

Nation (2001) remarked that the use of annotations has a number of advantages. First, difficult and presumably authentic texts are presented with no simplification or adaptation. Second, there is no interruption from the reading process and it is more time-saving than dictionary use. Third, learners are supplied accurate meanings preventing them from guessing incorrectly. Lastly, learning might be encouraged with more focusing on annotated words. Annotations provide information on key words of a text in the form of L1 or L2 equivalents, picture, picture + sound, and/or video. They are regarded to be easier to use than dictionaries; they draw learners' attention to targeted words, help learners connect words to meanings immediately, and encourage learners to move back and forth between targeted words and annotations (Nagata, 1999).

Annotations are claimed to support the comprehension of authentic texts and allow learners to check the accuracy of their guesses about the meaning of words. They might increase the autonomous active processing of L2 input and can be used for tailor-made

vocabulary learning tasks. Also, they are appropriate for less frequent words in L2 texts (Lenders, 2008).

Models for annotation technologies which currently exist today, their advantages, disadvantages and influence on readers and the characteristics of the annotations were reviewed in Wolfe's article (2002).

Advantages of Annotations

1.Developing understanding of source material

2.Quote for later review

3.Enable critical thinking

4.Comprehend and comment

5.Record intermediate and unselfconscious reaction to text

Effects of Annotations

1.Developing recall of emphasizing items

2.Affect perception of specific arguments

3.Decrease tendencies to unnecessarily summarize

As it is obvious from the controversial and diverse views on annotations, more research should be done to illuminate the efficiency of such formats and the parts of Roby's taxonomy, which identifies media as a "form" of annotations.

To clarify, while hypermedia annotations offer a various kinds of media such as text, audio, video, animations or images to present visual, aural or verbal information traditional annotations can employ only pictorial and textual aids to help the reader's understanding (Chun & Plass, 1996). Traditional annotations might be provided either within the text in the form of marginal annotations or as a list at the end as glossaries, on

the contrary, hypermedia annotations are provided within the text in different forms of multiple media. Therefore, learners can read passages faster with the aid of both print and hypermedia annotations.

Martínez-Lage (1997) also states that computer aided annotations are more effective than traditional ones in terms of having a better overall comprehension of the text as diverse multimedia annotations such as sounds, images, cultural and geographical references might be used. Texts with hypermedia annotations help learners to make a more global approach to the text. Enabling learners to access the text immediately with no interruption is one of the advantages of hypermedia annotations. They also present information in multiple formats which are more understandable and faster to manage for language learners.

2.2.4. Studies on Multimedia Annotation and Language Learning

The use of annotations has been an extensively researched area, and the use of annotations in reading, especially in computerized learning environments might enhance deep levels of text comprehension. A pilot study was carried out by Lomicka (1998) to explore the influence of multimedia annotations on reading comprehension. Twelve participants were grouped into three as full annotation, limited annotation, and no annotation. The think aloud approach was applied in the data collection process and the results demonstrated that the participants used reading with full annotations in computerized environments more since it increases a deeper level of text comprehension. Even though the generalizability of the results is questionable due to the number of participants and the evaluation of reading comprehension tests, the study ensures empirical evidence to promote the practicality of multimedia annotation.

Another study was conducted by Zarei and Mahmoodzadeh (2014) about the effect of multimedia annotations on L2 reading comprehension and vocabulary learning. The sample of the study consisted of 65 female students. These students were divided into four group, one of which was the control group and three of which were experimental groups. The students in experimental groups used multimedia glosses during vocabulary learning. The students in all groups were applied pretests and posttests in terms of vocabulary knowledge and reading comprehension. To analyze the data, One Way ANOVA test was used. The results showed that the students which used multimedia annotations performed better on vocabulary production than the students which were in control group. However, results indicated that multimedia glosses did not cause any significant difference on reading comprehension. Zarei and Mahmoodzadeh (2014) emphasized this result was an unexpected one, and listed some reasons that caused this; which were students' low level of proficiency, lack of time for students to get used to computer-based instruction and individual differences.

Similarly, Tabatabaei and Mirzaei (2014) conducted a study on EFL learners in order to examine the effect of multimedia glosses on learning and comprehension of idioms. The sample of the study included 60 female university students. They were divided into four groups, three of which were experimental groups that used multimedia glosses and one of which was control group that did not use any multimedia glosses. Students were chosen depending on their scores of Nelson standard achievement test to ensure the homogeneity of students' proficiency levels. Then, they were given three reading passages with multimedia glosses, and these reading passages were given via internet, and students could work at their own pace. After students studied those three reading passages including target idioms, a comprehension achievement test was applied and the data was analyzed

with One sample t-test and One-way ANOVA. The results of the study was similar to Zarei and Mahmoodzadeh's (2014) study. The students in experimental groups significantly outperformed the control group. They could produce the target idioms better than control group. Tabatabaei and Mirzaei (2014) emphasized these results indicated the fact that multimedia glosses were influential in L2 learning in terms of reading comprehension and vocabulary learning.

Arkün and Akkoyunlu (2008) examined the development process of the environment according to the Analyze, Design, Develop, Implement, Evaluate, Instructional Design Model (ADDIE). They observed the effect of multimedia learning environment on achievement and students' ideas on this environment. The experimental group consists of 85 fourth grade primary school students, 50 students are females and 35 are males. Pre-test and post-test procedures were conducted in order to measure the effect on achievement. Consequently, it was found that the multimedia learning environment positively affects achievement scores of students.

Ariew and Ercetin (2004) explored whether there is a link between reading comprehension and the use of different types of hypermedia annotations. Advanced and intermediate levels of ESL learners participated in the study. A tracking tool which recorded the time spent on the use of annotation by participants was used as data collection tool. It was concluded that reading comprehension of advanced ESL learners was not affected by the use of annotation. Furthermore, intermediate learners were found to be negatively affected by annotation use. Ultimately, data derived from questionnaires demonstrated that the participants' attitudes toward reading were positively affected by hypermedia reading.

Türk and Erçetin (2014) examined the effect of interactive and simultaneous display of multimedia annotation on L2 incidental vocabulary learning and reading comprehension. The sample of the study included 82 students with lower level English language proficiency. For interactive use of multimedia annotation, students were allowed to choose which multimedia annotation to use. For simultaneous display of multimedia annotations, students were given definitions and associated pictures in a single gloss. The ANOVA and t-test were used to analyze the data gathered from the students through reading comprehension test with multiple choice items and vocabulary achievement test with form recognition, matching definitions and synonyms. The results showed that students use multimedia annotations less when they were allowed to choose, and simultaneous display of multimedia annotation caused better performance on vocabulary learning and reading comprehension, which is compatible with Generative Theory of Multimedia Learning.

Sakar and Ercetin (2004) conducted a study in order to examine the EAP students' preferences of annotations and the effect of annotations on EAP students' reading comprehension. The sample of study included 44 intermediate Turkish students, 26 of which were males and 18 of which were females. These students studied English for academic purposes (EAP) at a Turkish university. It was found out that the learners preferred visual annotations more than text or audio annotations. However, reading comprehension was negatively correlated with the frequency of access to annotations (r= -0.42) and the amount of time spent on annotations (r= -.42). The results also showed that reading comprehension was negatively affected by pronunciation of the words and videos.

Similar to the Sakar and Erçetin's (2004) study, Lew and Doroszewska's (2009) study showed negative effect of annotation use. The sample of the study included 56 Polish

students who were learning English at university. Their proficiency levels were between A2 and B1 according to Common European Framework of Reference for Languages scale. Students were given a reading text on computer and they could check four types of glosses for ten target vocabulary item. The glosses were L2 definition, L1 translation, animated picture and example sentences. The data collection took 40 minutes. For the first 10 minutes students were conducted a lexical knowledge pretest; they fulfilled online reading task for the next 15 minutes; they were conducted a vocabulary retention test for 10 minutes that required students to write L2 definitions or L1 translations of target vocabulary items, and they were conducted a reading comprehension test for 5 minutes. To analyze the data, the descriptive statistics and the multiple regression analysis were used. The results showed that students preferred L1 translations of target vocabulary items mostly, and students that used animated pictures mostly retained fewer words. Lew and Doroszewska (2014) emphasized that this result was an unexpected one. Some possible reasons for this were that the pace of the presentation was not suitable for students to understand meanings of words, animation could distract students to build a form and meaning relationship for words, animations could mislead students in understanding the meaning and they may not look up L1 translations. All of these possible reasons show that it is highly important to be careful while choosing which annotation to use in order not to mislead students and prevent them from learning meanings of words correctly.

Wang (2014) did an empirical research on optimizing cognitive load in multimedia learning from abroad and in China. It was found the students' mean scores of all tests and the number of successful students in TEM-4 in the experimental group are more than the mean scores and the number of students in the control group. The results indicated that significant differences was found in Cloze, Vocabulary and Structure Reading

Comprehension, Paraphrasing and Total Score. However, there was no significant differences between their mean score in Translation and Writing. It can be inferred from this study that optimizing cognitive load in the multimedia learning enhances improving English learning efficiency.

In a recent study Ercan (2014) explored the effect of a multimedia learning material which he developed for the 5th grade science course topic titled "Food and Healthy Nutrition" on science attitudes and academic achievement scores of students. In his study, where 62 5th grade students participated in a research design of a control group, a pre-test-post-test quasi experimental groups, it might be inferred that , based on findings, the use of multimedia environment lead to more successful academic scores in science education.

Soruc (2014) explored what makes redundant presentation of multimedia learning difficult. Only two participants were included in the study. Soruc (2014) applied think aloud protocols and interviews to see possible redundancy effects. The findings of the study revealed that the on-screen text (AN-T) caused the presentation to become difficult for both participants (split attention effect) to comprehend caused burden on working memory. Another difficulty in the AN-T was the lack of moving arrows, and this also caused difficulty about where to look or where to concentrate while it was narrated. A final finding was that the participants felt that they were more relaxed in the presentation when it was narrated by the non-native speaker compared to the one with native.

In an up to date study Izquierdo, Simard and Garza Pulido (2015) explored the effects of two types of Multimedia Instruction (i.e., Multimedia Instruction with or without Language Awareness Tasks) on learners of French at two different L2 proficiency levels (i.e., low or intermediate) and on two types of L2 learner attitudes (i.e., attitudes towards L2 learning or towards the L2 class). Findings of the study indicated that there is a positive

increase of classroom attitudes solely on intermediate learners who were provided Multimedia Instruction without Language Awareness Tasks. Another finding is that there have been almost identical attitudes towards language learning in all of the experimental conditions.

2.2.5. Studies on Multimedia Annotation and L2 Vocabulary Learning

The research regarding the use of annotation (Hulstijn, Hollander, & Greidanus, 1996; Yanguas, 2009) generally focuses on two topics. Firstly, it explores the impacts on reading and secondly, it investigates whether the use of annotation enhances vocabulary learning (Alessi & Dwyer, 2008; Yanguas, 2009), particularly for incidental vocabulary learning. Many studies advocated that multimedia annotation use is influential in enhancing various aspects of SLA, involving vocabulary, listening, and general reading comprehension (Chun & Plass, 1996; Lomicka, 1998; Ridder, 2002; Ercetin, 2003; Sakar & Ercetin, 2005; Yanguas, 2009). Ariew (2006) points out that there is a strong relationship between hypermedia annotations and incidental vocabulary learning. According to him, language learners can comprehend texts better with the help of hypermedia annotations, yet annotations necessitate a lot effort in terms of choosing the suitable information and placing it appropriately to make learners to notice the information given.

Since 2000 many studies have been conducted to examine the impact of multimedia annotations on the acquisition of vocabulary (Akbulut, 2007; Al-Seghayer, 2001; Yanguas, 2009; Yoshii & Flaitz, 2002).

Al-Seghayer (2001) and Akbulut (2007) used similar designs including text, graphic and video annotations for participants in three different groups. In this study, 32 participants were divided into three groups as dynamic video, pictures, and text

annotations. In data collection recognition and production tests, face-to-face interviews, and questionnaires were applied. The results of the study showed that the dynamic video clip has more effect on teaching unknown vocabulary compared to other annotations (graphics and texts). Furthermore, the findings derived from face-to-face interviews and questionnaires also demonstrated that video was found fruitful in constructing a mental image. It promotes curiosity besides increasing motivation and concentration. It also includes a favorable mixture of different modalities. In a similar vein, Akbulut (2007) collected his data via pretest, posttest, and delayed posttest. The performance of participants in the incidental vocabulary test was significantly better with the help of graphic and video annotations. Nevertheless, there was not any significant difference among the groups in the results of reading comprehension tests.

Chun and Plass (1996) conducted a research on the effectiveness of annotations with different media types of vocabulary acquisition. They used a multimedia application called CyberBuch. This application was a multimedia application for German reading texts and included annotations associated with text, pictures and videos. The sample of the study included 160 sophomore, German students from three different universities in the United States. The students were measured with different types of hypertext annotations. They were text definition, text and picture, text and video. It was found out that the group that used both text and picture annotations were significantly better than two other groups who consulted the text annotations only, and text and video on a vocabulary test.

Annotations provide information on key words of a text in the form of L1 or L2 equivalents, picture, picture + sound, and/or video. They are regarded to be easier to use than dictionaries; they draw learners' attention to targeted words, help learners connect

words to meanings immediately, and encourage learners to move back and forth between targeted words and annotations (Nagata, 1999).

Annotations are claimed to support the comprehension of authentic texts and allow learners to check the accuracy of their guesses about the meaning of words. They might increase the autonomous active processing of L2 input and can be used for tailor-made vocabulary learning tasks. Also, they are appropriate for less frequent words in L2 texts (Lenders, 2008).

Studies conducted up to date on the effect of annotations on L2 vocabulary learning (e.g., Chun & Plass, 1996; Kost, Foss & Lenzini, 1999; Al-Seghayer, 2001; Jones & Plass, 2002; Yoshii & Flaitz, 2002; Rott, 2007; Yanguas, 2009) have revealed their effectiveness. Nowadays, SLA researchers have become more interested in what sort of annotations are most effective in enhancing L2 vocabulary learning (Yanguas, 2009; Hong, 2010) Annotations can be delivered in L1 or L2. Ko (2005) investigated the effect of L1 and L2 annotations on Korean college students' reading comprehension. To this end, 106 participants read the texts under Korean annotations (L1), English annotations (L2), and no annotations conditions. The data analyses showed that only L2 annotations enhanced students' reading comprehension. Ko (2005) also explored the learners' preference regarding L1 and L2 annotations. The results of survey revealed that most of the participants favoured L2 annotations.

Taylor (2006) conducted a meta-analytic research of experiments carried out on the effects of L1 annotations on second language reading comprehension. He concluded that learners provided with L1 annotations through computer comprehended significantly more texts than learners who were provided with traditional, paper based L1 annotations aids.

Yoshii (2006) examined the effect of L1 and L2 annotations on L2 vocabulary learning in a multimedia context. Yoshii's study revealed no significant differences between the L1 and L2 annotations, suggesting that both L1 and L2 annotations could be equally effective for L2 vocabulary learning.

Cheng and Good (2009) investigated the effects of three kinds of annotations on reading comprehension and L2 vocabulary learning. The three types of annotations were L1 annotations plus L2 example sentences, L1 in-text annotations, and L1 marginal annotations. The findings showed the effectiveness of L1 annotations in fostering L2 vocabulary learning.

Xu (2010) examined the effect of L1, L2, and L1 + L2 annotations on L2 vocabulary learning and found that L1 annotations were more effective in enhancing L2 vocabulary learning than L2 and L1 + L2 annotations. In the same line, the study by Hulstijn, Hollander, and Greidanus (1996) lent support to the effectiveness of L1 annotations on enhancing L2 vocabulary learning.

Yoshii (2006) conducted another study in order to examine the effects of L1 and L2 annotations on incidental vocabulary learning. The sample of the study consisted of 195 university students learning English as a foreign language. These students were divided into four annotation groups which were L1 text only, L2 text only, L1 text and picture annotation and L2 text and picture annotation. Yoshii (2006) applied two vocabulary posttests to students; and these posttests were an immediate test and a two-week delay test. At the end of the study, no significant difference between L1 and L2 annotation groups were found; but there was a significant difference between a text and picture annotation group and a text-only group on a definition-supply test.

In a recent study, Ko (2012) investigated the effect of L1, L2, and no annotations on vocabulary learning. Ninety university students in Korea were randomly assigned to three groups and were asked to read texts for a reading comprehension test. Then, they took an unexpected multiple-choice vocabulary test, which was repeated again four weeks later. Data analysis revealed that on the immediate vocabulary test the experimental groups outperformed the no annotation group, however, there was no significant difference between L1 and L2 annotation groups. The same results were obtained in the delayed post-test. The participants showed keen interest in having access to annotations. Interestingly, they favoured L2 over L1 annotations.

Lomicka (1998) did a research to examine the effect of multimedia annotations on vocabulary learning. The sample of the study included 12 native speakers of English in undergraduate-level French classes. During the research, these 12 student read a poem in French (L2) while they were thinking aloud in English (L1). There were three groups in the study in terms of accessing annotations, which were (1) no access to annotations, (2) access to all annotations of definitions in French and translations in English; (3) access to multiple annotations (definitions, images, pronunciation and translations in English). The students were randomly assigned to one of those three groups. It was found out that there were no statistical differences between three groups during think-aloud protocol data. However, the students learnt more lexical items when they used a variety of assistive multiple annotations.

Yeh and Wang (2003) also conducted a study on annotations effect on EFL vocabulary learning. The results showed that the significance of hypertext annotation use in EFL and vocabulary learning was influential, however it was inconclusive. Although both text-only and text and picture groups outperformed a text, picture and audio group,

there was not a significant difference between the second group (text and picture) and text-only group.

A more recent study, which used factorial design, (Biçer & Akdemir, 2015) examined the influence of multiple content forms use in web-based environments on English vocabulary learning. Participants of the study were 106 prep class students of a major Turkish university. The findings of this study revealed that supplying only the audio content of target words was found more effective than giving students audio and visual content at the same time. The findings contradicted The Cognitive Theory of Multimedia Learning (Mayer, 2001) which stresses that providing more than one channel (dual mode) at the same time without any rise in cognitive load and the findings were in line with The Cognitive Load Theory which claims that increasing cognitive load may lead to worse performance in learning especially in cognitively less able students.

Wu (2015) designed a Basic4Android smartphone application (Word Learning-CET6) and explored its impact as a tool in facilitating EFL students learning vocabulary. The application, with 1274 vocabulary, was developed to be downloaded and installed into smartphones using Android operating system. In order to test the impact of the program, participants were assigned into two groups as an experimental group with app and a control group without app. Vocabulary knowledge levels of the participants were measured both before and after the treatment. The findings of the study revealed that the participants using the app significantly outscored their counterparts in the control group in terms of new vocabulary gain scores.

In sum, the results of the previous studies above point out that the use of multimedia, hypertext annotations, mobile applications etc. which include a variety of verbal and pictorial information, appear to increase L2 learners' interests and motivation of

L2 reading as well as acquiring new vocabulary; texts and words attached with pictorial representations rather than paper-based linear information draw much attention of L2 learners leading to performance increase to some extent in many learning conditions. Nevertheless, whether different types of hypertext annotations enhance vocabulary acquisition of L2 learners was somewhat inconclusive. Therefore, our study might be significant in determining which annotation types are more effective and interesting for learners and figuring out whether they facilitate learning of new vocabulary in an L2 environment.

All of the studies discussed above proves the fact that multimedia annotations and their impact on language learning process and L2 vocabulary learning have been important research subjects. However, they alone may not be enough to fully understand L2 learners' language learning process. It is known that second language learning process can be affected by some individual factors and learners' learning style is one of them.

2.3. Learning Styles

2.3.1. Definition

Educational field has identified a number of different factors on the learning process of students (Reid, 1987). Learning styles, as one of these factors, has gained much popularity in the literature (Dunn and Griggs, 1989). Learning styles have been defined in several ways: Learning styles are as preferred ways of learning unconsciously and it differs from one learner to other. Learning styles are students' approaches during learning something new or to cope up with a new problematic educational situation (Oxford, Ehrman, & Lavine, 1991). Learning styles are set of characteristics, which are inheritly imposed, that make learning environments superb for some and disaster to others (Dunn and Grigss, 1988). Differences among students in the use of various senses to comprehend,

organize and retain experience (Reid, 1987). Reid suggested to main hypotheses about learning styles. While the first hypothesis claims that all learners have their own learning styles and learning strengths and weaknesses, the second hypothesis puts forward that when teaching and learning styles do not match, it causes a frustration, demotivation and failure in the learning environment. Reid's hypotheses have been supported by Oxford, Hollaway and Horton-Murillo (1992) claiming that EFL teachers should take account of students learning styles while constructing their own teaching styles. Otherwise mismatches between the styles of teachers and students might affect learning potentials of students and their attitudes towards learning. It is wise to recommend that teachers and students had better know their style and adapt and employ them in a harmony (Oxford. et al., 1992). Sprenger, (2003) remarks that the learning styles students should be assessed and be adapted by their teachers in order to make more efficient classroom methods which fit best to each learning style of students.

2.3.2. Types of Learning Styles

There have been many researchers (Dunn & Dunn 1978; Gregorc 1979; Dunn 1983, 1984; Kolb, 1984; Reid 1987; Fleming 2001; Duff 2004) who did studies on learning styles and some learning styles models were suggested by these researchers. Dunn (1983, 1984), and Garger and Guild (1984) used perceptual learning styles and learning styles interchangeably and they have demonstrated that learners have four main perceptual learning channels:

1-Auditory Learning (learning by listening to people or any form of oral signal)

2-Visual Learning (learning by seeing charts, diagrams, pictures etc.)

3-Tactile Learning (hands-on learning, learning by doing)

4-Kinesthetic Learning: (Learning by participating a learning situation physically)

Gregorc (1979)'s learning styles model includes four learning styles, and these are concrete-sequential, abstract-sequential, abstract-random, and concrete-random. According to this model, concrete-sequential learners would prefer to learn by doing, and tasks' being in a logical order during the learning process. Abstract-sequential learners would like to learn with symbols and ideas, and they like thinking sequentially. Also, they do not like being distracted during the tasks. Abstract-random learners would prefer to concentrate on people and the learning environment, and they like establishing dialogues. Concrete-random learners like taking risks while learning, and they prefer finding out solutions to the problems by using trial and error method.

Dunn and Dunn (1978)’s model focuses on the elements that affect a learner's learning style. These elements are divided into five stimuli groups and these groups are environmental, emotional, sociological, physical, and psychological. Environmental stimuli group includes the conditions about sound, light, temperature and design. Learners' preferences about studying in a quiet environment or by listening to music, and studying with a ceiling lamp or with a table lamp can be given as examples for the environmental stimuli group. The second stimuli group is emotional stimuli group. Motivation, responsibility, and ambition are some of the examples of this stimuli group. That some learners would like to study alone and others can learn better within groups or with pairs explains sociological stimuli group in Dunn and Dunn (1978)'s model. Another stimuli group is physical stimuli group and this group includes perception, mobility and intake of learners. Learning by seeing, hearing or doing is shaped depending on the elements of the physical stimuli group, according to this model. The last group of Dunn and Dunn (1978)'s model is psychological stimuli group. This group includes learning analytically or globally, and learning using with left or right brain.

Another classification of learning style is Kolb (1984)'s model. Kolb (1984) classifies learning styles into four different groups. The first one is diverger learning style. Diverger style learners are accepted as having strong imaginative skills, they can see the things from different angles, and they are good at getting on well with people. The second one is assimilator style. The learners who have assimilator style prefer working with abstract ideas, inductive learning, and also they are good at suggesting theoretical models during the learning process. The third learning style of this model is converger learning style. Convergers like doing something technical, they prefer deductive learning, and they do not focus on social interactions. The last learning style of Kolb (1984)'s model is accommodator learning style. The learners with accommodator learning style like taking risks, learning by doing, and solving problems with their own instincts.

Fleming (2001) is another researcher who suggested a learning style model. This model is named as VARK model. VARK is a word composed of the initials of the words "visual", "aural", "read" and "kinaesthetic", each of which is a learning style. Visual learners prefer learning by seeing things and, thus, visuals such as maps, charts, diagrams, graphics and word pictures are very important for them. Aural learners prefer learning by hearing things, so they prefer explaining their ideas to their classmates and having discussions with them and their teachers, also they prefer using tape recorders. Read(/write) learners like writing things such as essays, articles, taking notes during the lessons and reading textbooks, webpages and some printed documents during the learning process. Kinaesthetic learners like learning by participating in a learning situation physically and they like learning by trial and error method.

Duff (2004) also suggested a model concerning learning styles, and this model is called as RASI (Revised Approaches to Studying Inventory) Model. According to this

model, students can have three different approaches to studying and these approaches are deep approach, surface approach and strategic approach. Students with a deep approach to studying like learning new things, connecting the newly learned information to the previous ones, and using logic. On the other hand, students with a surface approach to studying prefer learning by heart and they do not try connecting newly learned information with previous ones. Students with a strategic approach to studying like being organized while studying, and they learn to be successful by getting the highest grade.

According to James and Gardner (1995), there are three types of learning styles: perceptual, cognitive and affective. He stated that even though one learn better with the help of one of these styles, each of us makes use of all three styles to some extent.

Reid (1987) identified learning style preferences as the perceptual channels through which learners like to learn best. These channels are classified into auditory (learning by listening to audios, tapes and people), visual (learning by reading and studying charts, graphics and diagrams), kinaesthetic (learning by physical participation), tactile (hands-on, learning by doing, e.g. doing lab experiments, building models), group (learning by studying with other learners in a group), and individual learning (studying in isolation).

In fact, categorizing learners solely in one specific learning style may not be true as they might have more than one learning style since their reactions might be quite different when they come across with different information in different learning environments. One may have different learning style with varying degrees. Ultimately, it is true to consider learning styles as value-neutral; that is, there is not a better or superior learning style for anyone. Thus, learners should be encouraged to extend their learning styles in order to gain strength in diverse learning situations (Reid, 1998).

Based on the information above, we have decided to use Reid's "Learning Style Preference Questionnaire (PLSPQ)" in this study in order to identify the learning styles of participants since it has been regarded as a validated questionnaire in literature and it has been used in a number of studies on different research subjects and in different countries so far (Wintergerst, DeCapua & Verna, 2003; Mulalic, Shah & Ahmad, 2009; Naserieh & Sarab, 2013; Zhang, Sung, Hou & Chang, 2014). The terms "perceptual leaning style" and "learning style" will be used interchangeably throughout the paper.

2.3.3. Studies on Learning Styles

There have been many studies on hypermedia and learning styles in isolation, but studies that have explored the effect of hypermedia annotations on language learners having diverse learning styles are scarce. The following section primarily reviews the previous studies conducted in the literature.

Mayer and Sims (1994) conducted a study on the interplay between individual differences and gains of students from verbal to visual teaching. They examined if an animation and narration about the way a system processes are fruitful when displayed simultaneously or one after another. 183 college students participated in this study. Two different experiments were done for the study. While the former experiment involves 86 participants, the latter one includes 97 participants. There were three groups in each experiment: students with low-spatial ability, students with high-spatial ability, and a control group containing both types of students. A combination of spatial ability score driven from the mental rotation and paper folding tests was specified by the addition of the scores from the related tests. In order to measure learning of the students the number of reasonable solutions that were produced by students for different problem solving items were calculated. Findings revealed that the number of sophisticated solutions to subsequent

problems generated by simultaneous group is higher than the ones of successive group. A strong impact was found for high-spatial ability group yet it had no effect on low-spatial ability group.

Ross and Schulz (1999) examined the interrelation between cognitive learning styles (concrete random, abstract random, concrete sequential and abstract sequential) and computer-assisted instruction (CAI). More particularly, they explored the nature of interaction between the participants with diverse cognitive learning styles and multimedia learning environments. In order to determine dominant cognitive learning styles of 70 undergraduate medicine students the Gregorc Style Delineator was used. The identical CAI program which consists of a pre-test and a post-test was used in all cognitive learning style groups. Findings revealed that dominant learning styles of the participants did not cause a significant difference in interaction patterns of participants with CAI software. Nevertheless, significant differences were found in achievement test scores between the learning styles. When both types of test were compared, the abstract random learners performed worse than abstract sequential learners. Modest gains were found between the concrete sequential and concrete random groups. The researchers implicated that Computer-Assisted Instruction is effective to some extent but might not be suitable for all types of learners.

Surjono (2015) examined the influence of multimedia preferences and learning styles on undergraduate student achievement scores in an adaptive e-learning system for electronics course at a major state university in Indonesia. The findings demonstrated that students with similar multimedia preferences and learning styles outscored their friends with dissimilar multimedia preferences and learning styles when they are given the materials related with an online electronics course they take.

Aforementioned studies above have indicated that even though how participants interact with the Computer-Assisted Instruction software was not found significantly different, the learning outcome was found significantly different depending on participants' dominant learning styles (Ross & Schulz, 1999). When the results of the studies are contrasted, Ross and Schulz (1999) stated that learning styles were highly effective on the achievement scores of learners. It was found that the achievement scores were affected, both from learning styles and the preferences of students in using the media forms. Moreover, it was found that hypermedia learning environment is influential on learning outcomes of students in terms of differences in learning styles.

Since the studies mentioned above were not conducted in language learning settings, the results cannot be generalized to L2 learning/teaching environments.

2.3.4. Studies on the Relationship between Learning Styles and Language Learning

The studies below were particularly conducted in language learning environments. Even though their numbers are not much, they are closely linked to the current study.

Raschio (1990) carried out a study which examined the interplay between computer assisted language learning (CALL) and cognitive style. 62 students of Spanish participated in the study. The participants were applied Group Embedded Figures Test (GEFT) in order to determine their degree of field independency-dependency. They are ranked in three levels as field dependant, field central and field independent. Then they were grouped into two as the control group and the treatment group. Both groups were expected to gain and use a structure in Spanish. While the control group was provided only printed materials, the treatment group received the CALL materials which were designed by the researcher. The findings made us conclude that no significant relationship was found between

achievement scores of students and the cognitive style level. This results indicated that CALL and traditional materials and methods were both influential for field independant and dependant learners.

Another study (Plass, Chun, Mayer & Leutner, 1998) questioned the possible effects of verbal and visual learning preferences of L2 learners on their learning outcomes. They also investigated the interrelationships between the use of annotations, reading comprehension of reading and the acquisition of vocabulary. The participants of the study were given a story in German, which has 762-word, in a computer-assisted learning environment. A number of different annotations were used to highlight the keywords in the story. During this process annotations were provided verbally, visually or in both ways. A vocabulary posttest and a reading comprehension posttest were provided to participants. In choosing annotations, whether visual or verbal, dominant tendencies of students were made use of. The tendencies of the students were determined with the help a log file which was recorded when students look unfamiliar vocabulary. It was concluded in the study that students comprehended the text better when they were provided annotation which is in line with their preferences. It was found that the students using both verbal and visual annotations recalled lexical items more than who had chosen only one type either verbal or visual. Finally, students were found to comprehend the text better when they were given the chance to select their own preferred annotation mode.

The studies above make us infer that participants can have more learning gains when they are given annotations according to their own preferences (Plass et al., 1998; Liu & Reed, 1994). They show positive attitudes towards classroom environment and towards language learning when they are exposed to multimedia instruction. Furthermore, it was

also indicated that hypermedia environments were found to be as equally influential as classroom environments for different learning styles (Raschio, 1990).

2.3.5. Learning Styles in E-Learning

While it is hard to decide which learning material is more convenient specifically for learning styles hypermedia annotations can appeal to more than one learning style at the same time. Hypermedia environments are appropriate to embody a number of different learning styles simultaneously as they cover diverse audio-visual and hands-on media types. Accordingly, learners are able to learn similar content regarding their own preferred individual learning styles. In a similar vein Lau (2013) remarked that multimedia (including annotations) is of great value in the classroom appealing to learners on more than one perception levels.

2.4. Theoretical Framework of the Study

2.4.1.Cognitive Theory of Multimedia Learning

2.4.1.1. Dual Coding Theory

Dual Coding Theory (DCT) (Paivio, 1990) argues the idea of pictorial-verbal system for knowledge construction. Paivio (1990) put forward this theory due to the fact that understanding the way information is transferred through different forms such as audio, text, video and graphic is important in foreign language learning process. The theory aims to examine how human cognition works with multiple media tools, because it was found out that concrete words which arouse clear images in human mind were remembered more easily than abstract words (Denis, 1984).

Dual Coding Theory is based on the activation of two separate subsystems. While a verbal system deals with visual, aural and articulation –language itself, namely- ; a

nonverbal (pictorial) system deals with images for shapes, sounds, and other non-linguistic objects and events (Paivio, 1991).

The Dual Coding Theory includes three levels treating verbal and nonverbal input. These levels are *representational level, associative level* and *referential connections* (Clark & Paivio, 1991). The *representational level* is about recognizing and perceiving the information of verbal or nonverbal system. In other words, it is direct arousal of verbal or nonverbal representations. The second level is *the associative level*. This level is about activating the representations within same verbal or nonverbal systems. The connections within verbal and nonverbal systems for words are included in this level. The third and the last level of Dual Coding Theory is *the referential connections*. The referential connection refers to the arousal of verbal system by nonverbal system, or arousal of nonverbal system by verbal system.

The Dual Coding Theory suggests that both verbal and nonverbal systems are effective and important for memory to improve (Abraham, 2001). Also, the verbal and nonverbal systems are both independent and interconnected. These two systems are independent since one of them can be active even the other is not. And these two systems are also interconnected, because an activity in one of them can trigger an activity in the other.

2.4.1.2. Generative Theory of Multimedia Learning

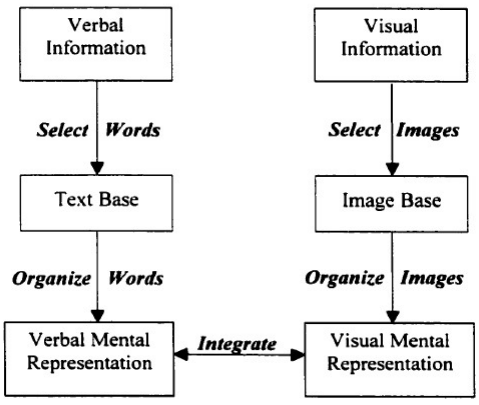
Mayer (2001) developed Generative Theory of Multimedia Learning, and this theory sees learning as an active process that includes selecting relevant information, organizing the selected information and integrating new information with pre-existing knowledge (Mayer, 1997). In other words, this theory suggests that the meaning is created

through three fundamental cognitive processes, which are selecting, organizing and integrating.

Generative Theory of Multimedia Learning proposes that both verbal and nonverbal information is accessed successively in short-term memory. After that, the working memory comes into play as the place where the information is processed with both verbal and visual representations to get a holistic form leading to more complete comprehending information. Generally, when language learners are offered both verbal and visual input via multimedia, they choose and arrange helpful information accordingly into different models. Thus, the relationships can be established to construct a kind of structure which is mental and meaningful. In fact, linguistic elements, specifically words, in verbal models offer discrete and linear information, but a holistic and nonlinear type of information is offered by pictures in other models. Therefore, learners can have better comprehension when they incorporate knowledge structures into the related models (Ariew, 2006).

In parallel with Pavio's (1991) Dual Coding Theory, Mayer's (1997) Generative Theory of Multimedia Learning puts forward that the processes of selection, organization and integration appear on two different systems: verbal systems for verbal input and nonverbal (visual) systems for visual input.

Figure 1: *Mayer's Generative Model of Multimedia Learning*



2.4.1.3. Cognitive Load Theory

Many researches that showed the limited capacity of short-term memory were conducted in past years (Sweller, 1994; Sweller & Chandler, 1994; Yeung, Jin, & Chandler, 1998). These research were conducted both with materials in computer and non-computer environments. The results of these researches showed that short-term memory was limited because of the intense activity that human mind is exposed at a specific time. This intense mental activity is called *cognitive load* (Sweller & Chandler, 1994).

Sweller and Chandler (1994) developed *Cognitive Load Theory* in order to understand individuals' different skills for processing verbal or nonverbal data. This theory tries to identify cognitive resources and which of them are used during learning process (Sweller, 1988). In this theory, three cognitive sources are defined mainly and these are *intrinsic cognitive load, extraneous cognitive load* and *germane (effective) cognitive load*.

The *intrinsic cognitive load* expresses cognitive effort required by data being learnt (Paas, Renkl & Sweller, 2003). Element interactivity and learning expertise functionalize the intrinsic cognitive load. It is possible to define element interactivity as the degree which constituents of a task are perceived, also processed at the same time, and it affects an individual's learning capacity on short-term memory. Because of the fact that element interactivity influences and shapes it intrinsic cognitive load has important effect on an individual's learning process in a both negative and positive way. For example, a learner's previous knowledge can reduce adverse effects of teaching materials that requires higher element interactivity. Thus, this type of cognitive load cannot be changed by the instructor during teaching process and it sometimes hinders learning.

The *extraneous cognitive load* is about how instructors present information to the learners, and it can be control by instructors with the help of design, presentation and

organization of information (Sweller & Chandler, 1994). In order to help students learn better, instructors should be careful about not giving extra, ineffective information while they have the opportunity to teach same material in a more simple and plain way.

The third cognitive source of the Cognitive Load Theory is the *germane (effective) cognitive load*. Like the extraneous cognitive load, the germane cognitive load is shaped by teachers. As in extraneous cognitive load, the presentation and organization of information, the activities and instructions given to students, affect the germane cognitive load (Paas, Renkl & Sweller, 2003). Teachers should trigger students' germane cognitive load during teaching-learning process, since it enhances learning and it results in successful schema construction.

All of these three learning theories explained above are quite important for understanding learning with words, audios, images and videos. Firstly, the Dual Coding Theory deals with pictorial and verbal systems for constructing knowledge and how human cognition works with multiple media tools while learning a language. Secondly, generative Theory of Multimedia Learning deals with creating meaning in short-term memory and suggests that a language learner is offered verbal and visual input via multimedia and s/he chooses the helpful information, organizes and integrates, which are three fundamental cognitive processes of this theory. Lastly, the Cognitive Load Theory aims to understand the impact of the intense mental activity, cognitive load, on language learning and constructing successful schema. Within the light of these, this study's theoretical framework was shaped based on these three learning theories.

CHAPTER 3

METHODOLOGY

3.1. Introduction

This part of the study includes research questions, hypothesis, research design, research context, participants, materials, data collection instruments, data collection procedure and data analysis respectively.

3.2. Research Questions

Accordingly, this study will explore two main issues regarding Mobile Assisted Vocabulary Learning (MAVL) in hypermedia reading environment: (a) What are the annotation preferences (text, pictures/graphics, audio, and video) of English as a foreign language (EFL)learners with different learning styles when they are engaged in a MAVL environment?, and (b) the effect of annotation use on Mobile Assisted Vocabulary Learning, Recall and Retention.

Based on the main research questions, the main and sub-research questions of the study are as follows:

1. What are the annotation preferences (text, pictures/graphics, audio, and video) of English as a foreign language (EFL)learners with different learning styles when they are engaged in a MAVL environment?,

1.a. What are the annotation preferences (text, pictures/graphics, audio, and video) of EFL learners when they are involved in a hypermedia reading text?

1.b. What are the perceptual learning styles of EFL learners when they are involved in a hypermedia reading text?

1.c. Is there a relationship between EFL learners' perceptual learning styles (visual and auditory) and annotation preferences (text, pictures/graphics, audio, and video) ?

2. Is there a significant difference between three groups, with multimedia annotation, with paper based annonation and with no annotation, in terms of vocabulary learning and retention? If so, what particular types of annotations do affect vocabulary achievement of target words?

2.a Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment?

2.b. Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of vocabulary retention under Mobile Assisted Vocabulary Learning environment?

3.3. Hypotheses

Based on the information above the hypothesis of study is:

1. There is a relationship between EFL learners' perceptual learning styles and their preferences of annotation.
2. There is an effect of annotation use on Mobile Assisted Vocabulary Learning, Recall and Retention.

3.4. Research Design

A 1x4x2 factorial design was used to be able to explore the effects of hypermedia annotation types and different learning styles on Mobile Assisted Vocabulary Learning and retention levels of English learners through reading texts. While the first factor has one level (1.Number of annotation use), the second factor, type of annotation, has four levels (1.Text, 2.Pictures, 3.Audio,Video) and the third factor, learner styles, has two levels (1. Visual and 2. auditory).

To recapitulate, the study made use of multiple sources of data were utilized to overcome the deficits of mono-method studies, to increase the amount of research data, to achieve higher levels of validity and credibility, to enrich the nature of research data (Field, 2009).

3.5.Research Context

This study took place in 2014-2015 academic year in a state school in which Fatih Project is applied in Kocaeli, Turkey. Fatih Project includes 57 schools in 17 provinces of Turkey. The medium of instruction is English and students take 4 hours of English courses per a week with a curriculum which is applied in all secondary education schools in Turkey. The students have both paper-based coursebooks and electronic equivalents of their coursebook in their tablet computers which are delivered to all students in each school covered in Fatih Project. What follows was retrieved from (http://fatihprojesi.meb.gov.tr/tr/english.php, 2012) to give a better portrait of Fatih Project setting.

Fatih Project

"Movement of Enhancing Opportunities and Improving Technology", known as FATIH Project, is regarded as one of the most important educational reforms of Turkey. It suggests that each school in Turkey will be equipped with "Smart Classes". By this way 42.000 schools and 570.000 classes will be have latest educational technologies converting traditional classes into modern computerize smart classes. Fatih Project has started with the objective of providing equal educational opportunities and developing technology in schools for the practical and influential use of Information Communication Tools in instructional processes in the education processes. In the light of this objective schools and classes of different levels of education, the preschool education, the primary education and

the secondary education, are equipped with tablets and LCD Touch Boards which appeals more sensory organs and different learning styles.

In-service teacher trainings will be organized to offer practical usage of the ICT technologies in the classes. Throughout this transformation process educational e-contents will be designed in parallel with the current teaching curricula. Therefore, Fatih Project is regarded to have 5 major parts. These are: supplying edutechnologies and software, designing and managing educational e-content, using ICT effectively in teaching programs, organizing effective in-service teacher training programs, and using ICT in a conscious, reliable, manageable and measurable way (http://fatihprojesi.meb.gov.tr/tr/english.php, 2012).

3.6. Participants

Participants of the study are five 10^{th} grade classes (122 students total) of a state elementary school in which Fatih Project is applied in Kocaeli, Turkey. Among these five classes, classes A and B were lectured by the Teacher X, classes C and D were lectured by the Teacher Y and the last class, class E was lectured by Teacher Z. One class from teachers X and Y were assigned as treatment groups (A-C) and classes B-D were assigned as control groups. While the former groups were exposed to which received Multimedia Vocastyle App., the latter one (B-D) were supplied vocabulary journals as a compensation through a paper-based annotation vocabulary practice. Finally, class E was assigned as the pure control group which received no treatment at all. The number of the students in each class was around 25. They share similar educational backgrounds.

3.7. Instructional Materials

3.7.1.Software Preparation

As mentioned above Vocastyle mobile application was designed specifically for this study. As tablets of students run in Anroid operating system Vocastyle should have been designed accordingly. The treatment were applied in a state high school in Kocaeli province and for practical and instructional reasons Yes You Can A.2.2. book was selected for the study. Two book includes 4 units for each term. So we only have 4 units for the spring term of 2014-2015 academic year. With the consensus of coordinating English teachers at the state school, unit 5 and unit 6 were selected to be supplemented with Vocastyle mobile app. The idea was that unknown vocabulary would be made more comprehensible via visual, aural, verbal and video annotations.

3.7.2. Selection of Reading Text

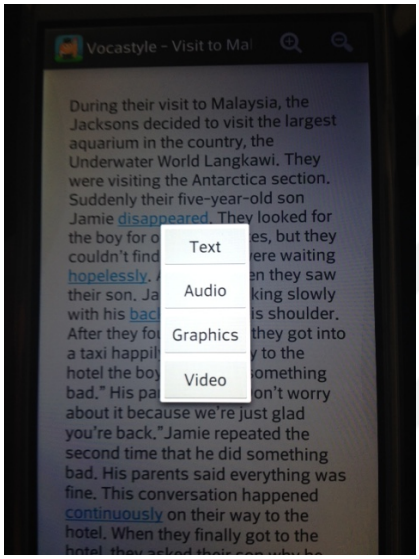
The selected units of the coursebook that we were supposed to supplement include 4 reading texts each. Therefore all of them were selected to supply context for the target vocabulary to be taught.

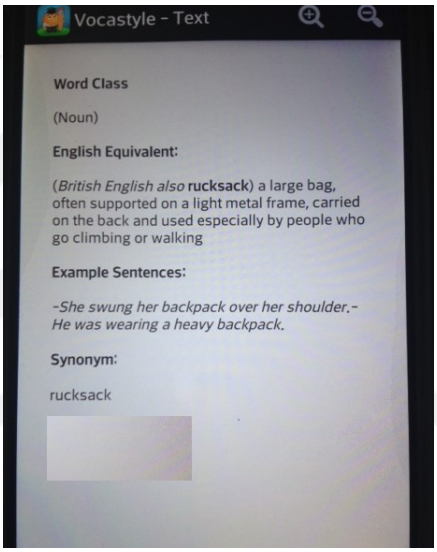
3.7.3. Target Words

Target words were selected from the Unit 5 and Unit 6 of the coursebook Yes You Can A.2.2. 3 English teachers chose the target words from those units. The number of selected words was 49. These words were presented in VKS to the students and their familiarity to the target words was checked. After the analysis the number of unknown words decreased to 38.

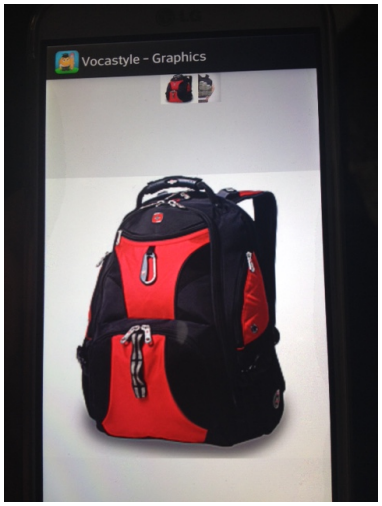
3.7.4. Gloss Selection

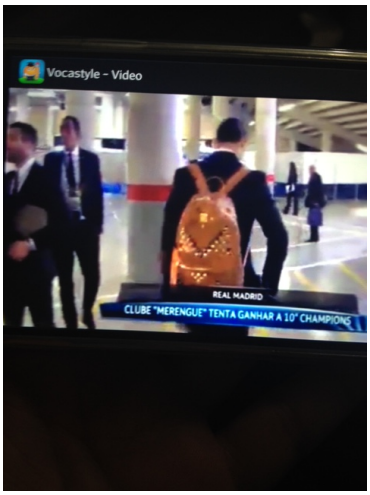
As the study focuses on multimedia annotations, glosses that can work on tablets were selected. The target words were presented to students in hypermedia texts in which they can click on and see the text, audio, graphic and video forms of glosses. According to their preferences they were exposed to the glosses as much as they want. Once they preferred textual gloss they saw the word class, English equivalent, an example sentence and a synonym of the target word.





Once they preferred audio, they could listen to aural input for the textual information from a native speaker and once they preferred graphics they could see a picture related to the target word. Finally, If their preference was video, they could watch a short video clip of the target word.





3.8. Data Collection Instruments

Data collection started at the beginning of the Spring semester in 2015-2016 academic year and was completed at the end of the same semester. Data for this study came from:

A) Vocastyle Log files

B) Reid's Perceptual Learning Style Preference Questionnaire (PLSPQ)

C) Prior Knowledge Test

D) Vocabulary Test

E) Vocabulary Journals

In the following part data collection instruments will be explained.

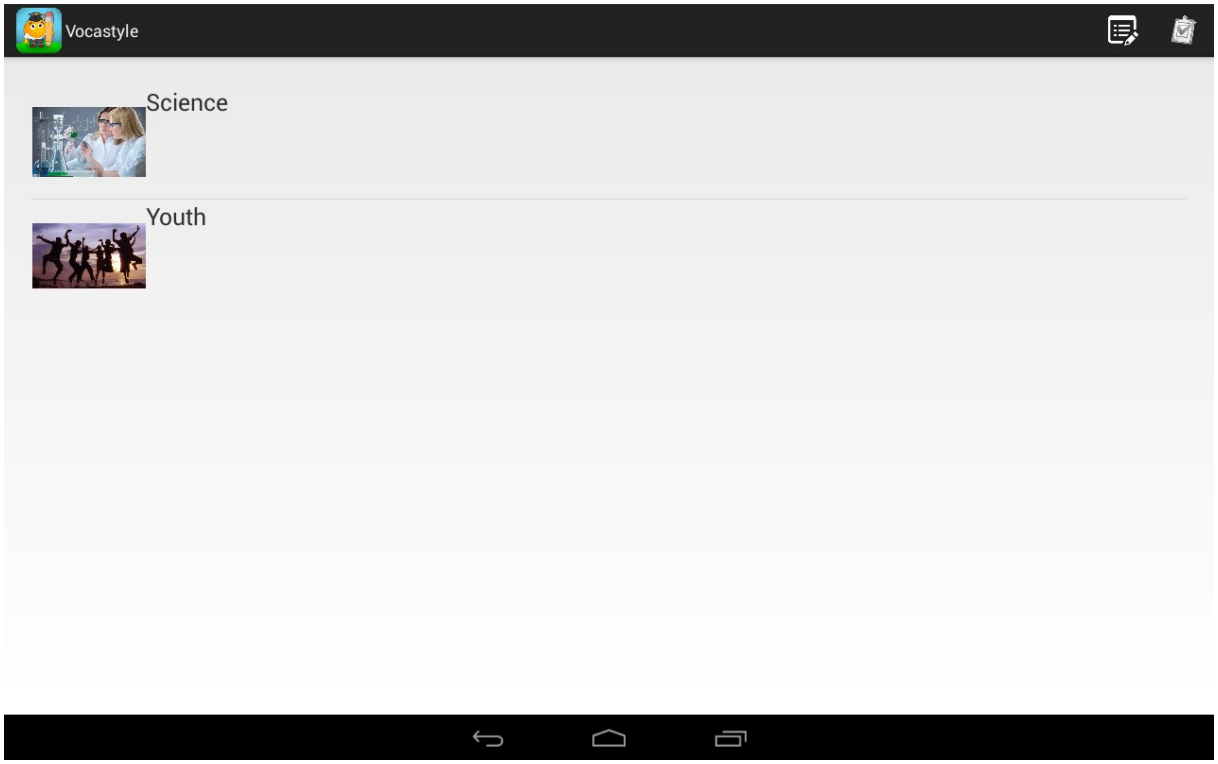
a) Vocastyle App. and Log Files:

For the requirement of this study an Android Application (VOCASTYLE) was developed by the researcher. The software was designed to supplement the English coursebook "Yes You Can" A.2.2 which is in use in the 10th grade of state schools in which multimedia learning is prevalent. It aims to support vocabulary learnings of students. In this vein, target words from the reading texts were selected totally from the

related coursebook. Then these words were provided with annotations with the help of Vocastyle app. While learners come across to an unfamiliar vocabulary in a hypermedia reading text in Vocastyle, a number of different annotations (text, audio, graphic and video) were provided. Once they clicked on the target word, options appeared regarding which type of annotations they selected. Then they were able to see their preferred annotation types as many times as they wish. The software kept track of each students preferred annotation types. The application provided a Log File which gives the number of annotations which were used in data analysis. The software will be explained in detail.

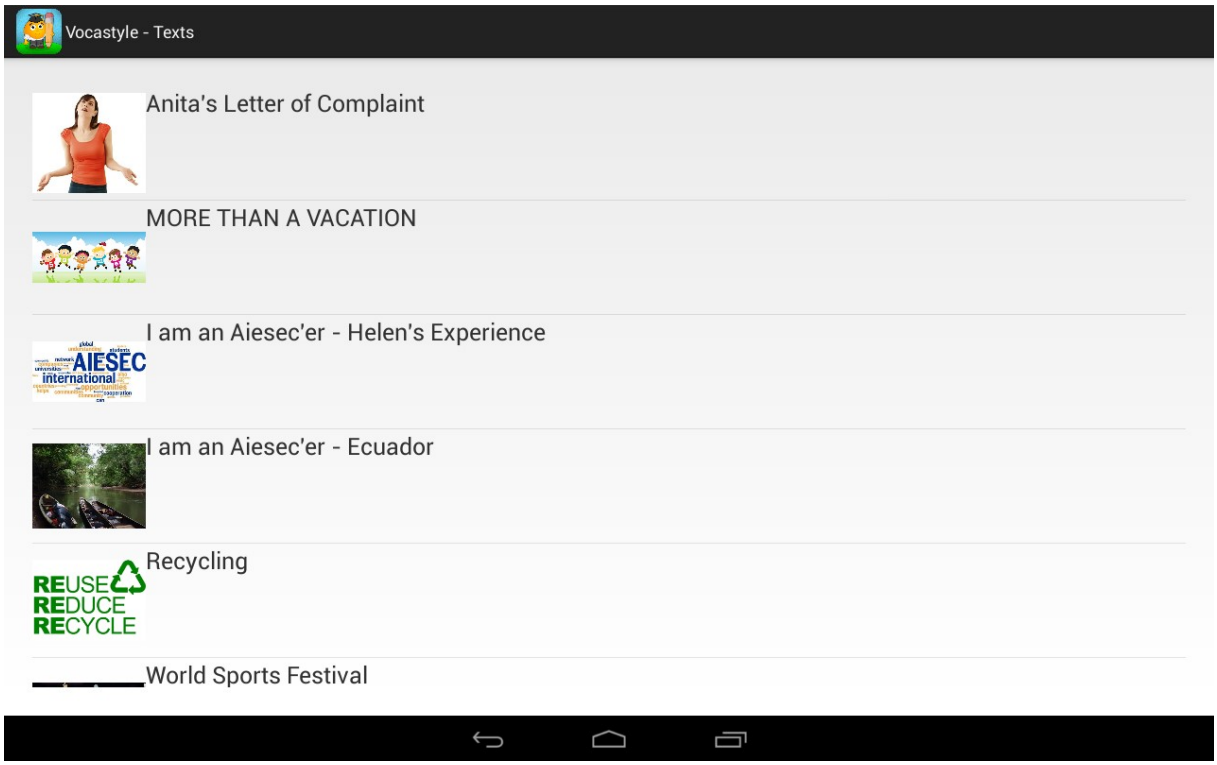
The Vocastyle was prepared as a plain and easy-to-use program. As it can be seen in Figure 2, the interface of the program is not complicated that made it user friendly. Once students opened the Vocastyle, they came up with this interface where they can choose the unit they wanted to study.

Figure 2. *The Layout of the Vocastyle*



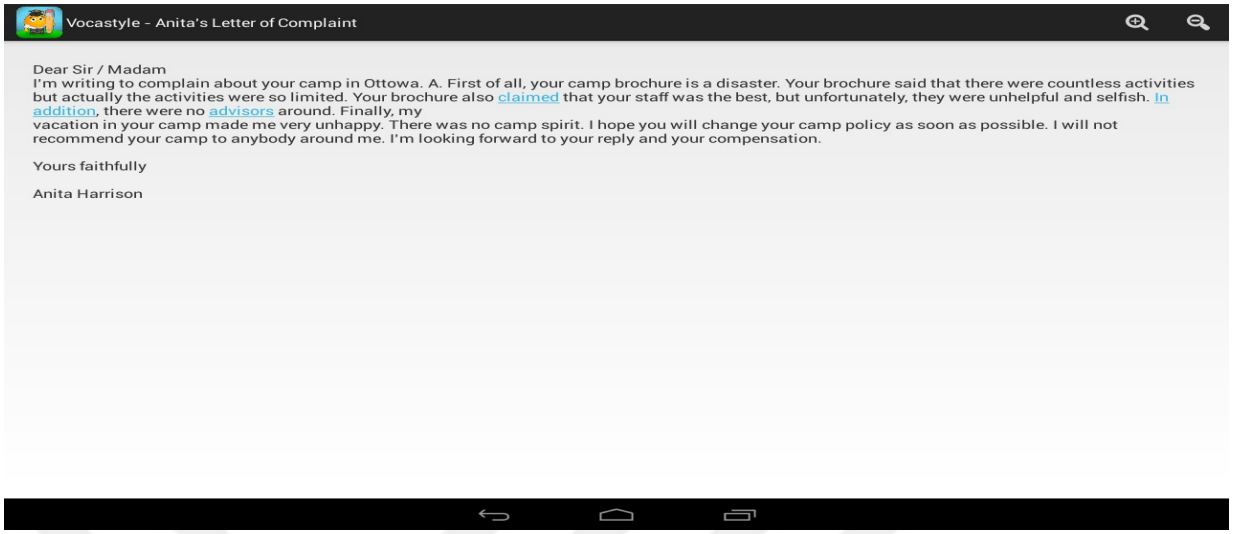
When students clicked on the unit, the next page included the reading texts in that unit. Students could easily choose the reading text they wanted to study. The page including the list of reading texts can be seen in Figure 3.

Figure 3. *The List of Reading Text in a Unit in the Vocastyle*



When students clicked on the name of the reading text they wanted to study, they came up with the full reading text with the target vocabulary written in blue and underlined, as it can be seen in Figure 4.

Figure 4. *The Page for a Reading Text*



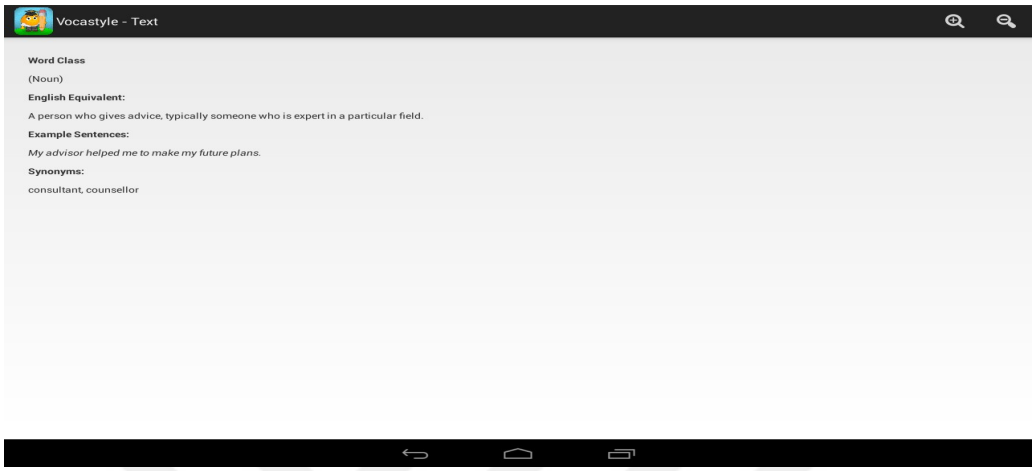
The reading text in Figure 4 was "Anita's Letter of Complaint". The target vocabulary items for this reading text were "claim", "in addition" and "advisor". When students clicked on the vocabulary item they wanted to study, the software provided the student with the annotations which can be seen in Figure 5.

Figure 5. *The Interface of Annotations for the Target Vocabulary Item*

After students saw this page, they chose the annotation they wanted to study. For text annotation, the Vocastyle provided word class of the vocabulary item, its English

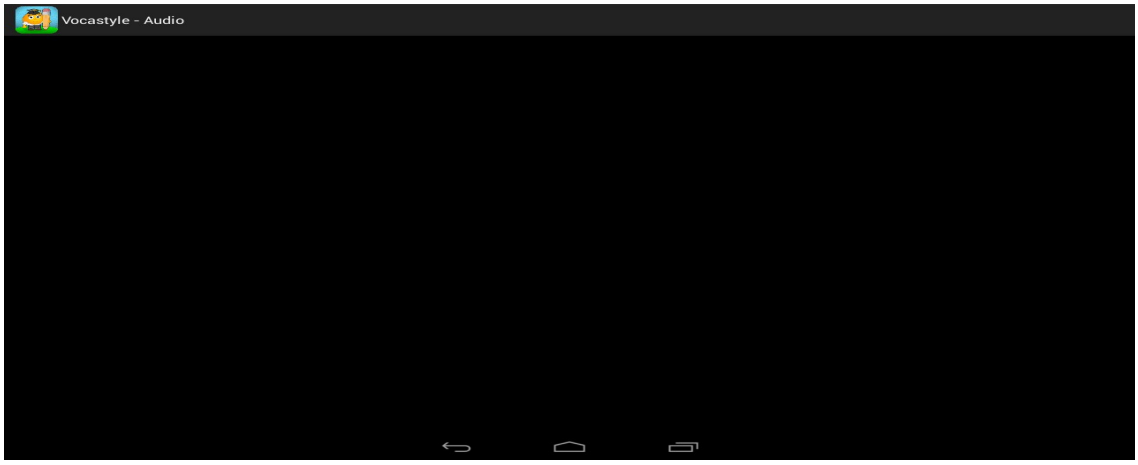
equivalent, example sentences and synonyms. The page of text annotation for the word "advisor" can be seen in Figure 6, as an example.

Figure 6. *The Page of Text Annotation for "Advisor"*



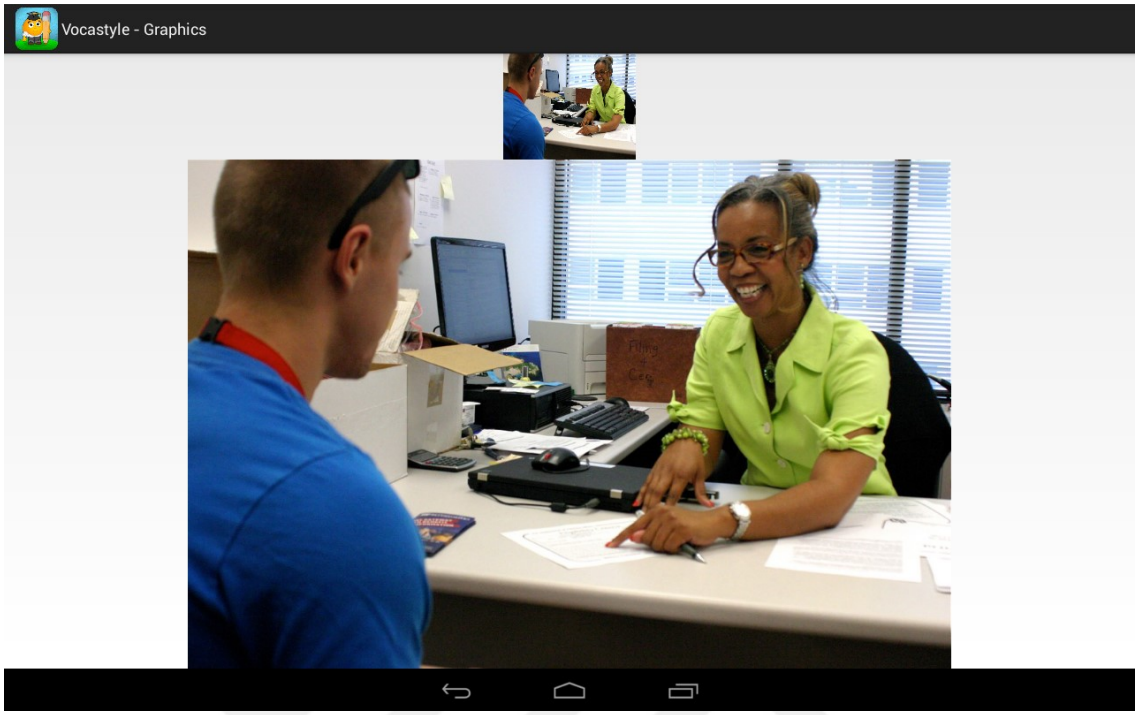
The audio annotation for each word included pronunciation of the word. When students clicked on audio annotation, they came up with a black page and listened to the audio. The page can be seen in Figure 7.

Figure 7. *The Page of Audio Annotation for "Advisor"*



The graphic annotation for each word included pictures related to the word. When students clicked on graphic annotation, they came up with the pictures. The page of graphic annotation for the word "advisor" can be seen in Figure 8.

Figure 8. *The Page of Graphic Annotation for "Advisor"*

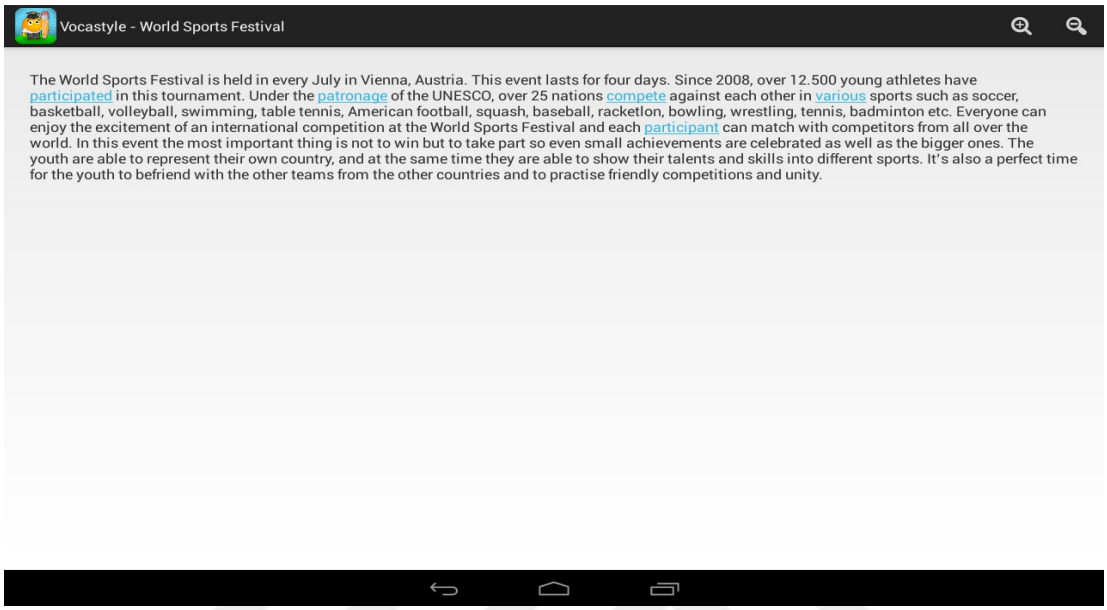


The video annotation for each word included a video related to the word. When students clicked on this annotation, they could watch the video as many times as they wanted. The page of video annotation for the word "advisor" can be seen in Figure 9.

Figure 9. *The Page of Video Annotation for "Advisor"*

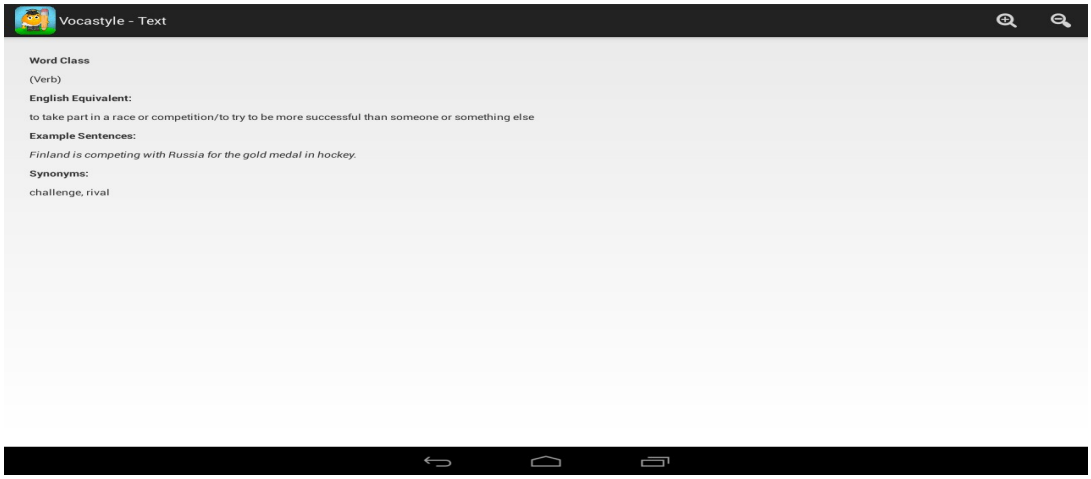
Another reading text included in the Vocastyle was “World Sports Festival”. The page for the reading text can be seen in Figure 10.

Figure 10. *The Page of the Reading Text “World Sports Festival”*



As it can be seen in Figure 11, the target vocabulary items for this reading text were “participate”, “patronage”, “compete”, “various”, and “participant”. As in the previous example, the text annotations for each word included its word class, English equivalent, example sentences and synonyms. The page of text annotation for “compete” can be seen in Figure 11.

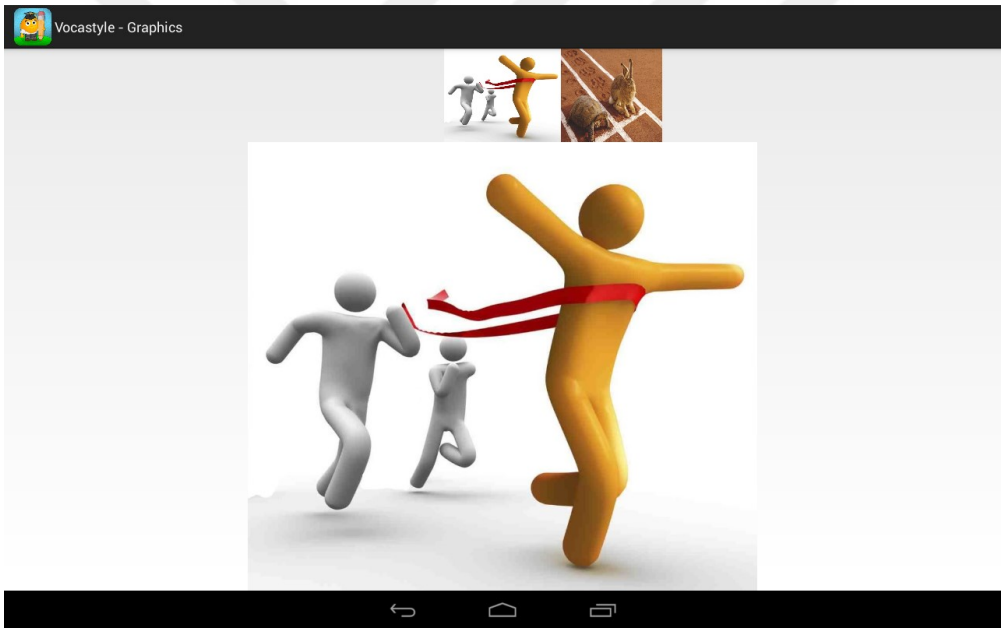
Figure 11. *The page of Text Annotation for “Compete”*



As for the word “advisor”, the audio annotation for “compete” included pronunciation of the word. When students clicked on audio annotation, they came up with a black page and listened to the audio.

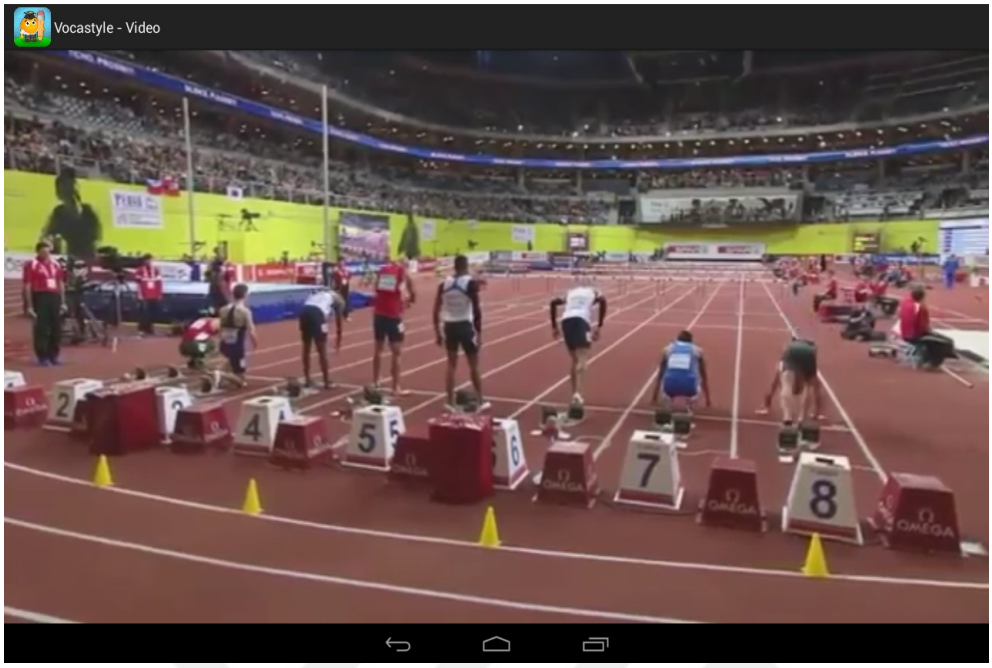
The graphic annotation for the word “compete” included two pictures related to the word. When students clicked on graphic annotation, they came up with the pictures. The page of graphic annotation can be seen in Figure 12.

Figure 12. *The page of Graphic Annotation for “Compete”*



The video annotation for the word “compete” included a video related to the word. When students clicked on this annotation, they could watch the video as many times as they wanted, as for the video annotation for the word “advisor”. The page of video annotation can be seen in Figure 13.

Figure 13. *The page of Video Annotation for "Compete"*



b) Reid's Perceptual Learning Style Preference Questionnaire (PLSPQ)

In order to determine the perceptual learning styles of learners Perceptual Learning Style Preference Questionnaire (PLSPQ) was used. Reid (1987) identified learning style preferences as the perceptual channels through which learners like to learn best. These channels are classified into auditory (learning by listening to audios, tapes and people), visual (learning by reading and studying charts, graphics and diagrams), kinesthetic (learning by physical participation), tactile (hands-on, learning by doing, e.g. doing lab experiments, building models), group (learning by studying with other learners in a group), and individual learning (studying in isolation). As this study specifically focuses on vocabulary learning in a multimedia learning environment with the use of tablets, and using a tablet only requires seeing and listening the target words, their related annotations as well as touching screen to pick their preferred learning styles, only two type of perceptual learning styles were used in the application. Therefore the findings obtained

from visual and aural parts of the questionnaire were used in the data analysis. As mentioned above the study concentrates on Vocabulary Learning, the questionnaire was adapted with a specific focus on vocabulary learning. Such as the items like “I learn better when I see things” was adapted to “I learn vocabulary better when I see it on the board”. But these adaptations were made after the developer of the original questionnaire gave the necessary permission to do so.

c) Prior Knowledge Test adapted from VKS Vocabulary Knowledge Scale (Wesche & Paribakht, 1996, 1997)

The measurement of foreign language vocabulary achievement of target words was done by vocabulary knowledge scale, VKS, developed by Wesche and Paribakht (1996). The major objective of the scale is to construct a practical instrument for the studies searching for the initial recognition and the use of the vocabulary. The original scale used a self-report knowledge on vocabulary items and included performance items to elicit both perceived and demonstrated knowledge of specific vocabulary in written form. The scale ranges from indicating complete unfamiliarity through recognition of the vocabulary item, to an idea of the meaning indicating the ability to use the vocabulary item in a sentence with grammatical and semantic accuracy.

Wesche and Paribakht’s VKS

I: I don't remember having seen this word before

II: I have seen this word before but I don't know what it means

III: I have seen this word before and I think it means _____ (synonym or translation)

IV: I know this word. It means _____ (synonym or translation)

V: I can use this word in a sentence. e.g.: _____ (if you do

this section, please also do section IV)

In this study VKS was used as a Prior knowledge test (VKS) one week before the treatment in order to identify whether they are familiar with any of the target words which were selected from the from reading texts in the English coursebook "Yes You Can" A.2.2 by their teachers at the state school. After the analysis of the results of VKS, the familiar words were extracted from the target word list. Then the last list of words was used to construct vocabulary test which was used as pretest, immediate posttest and delayed posttest. The test was piloted with a different group of students apart from experimental and control group students. Once the reliability of the test (Cronbach Reliability) was calculated 0.76 and sustained, it was applied to the experimental, control and pure control groups afterwards.

d) Vocabulary Tests

Vocabulary tests are useful instruments in measuring one's knowledge of vocabulary. Vocabulary achievement of target words has been regarded as the sum of intercorrelated subknowledges like knowledge of spoken and written form, knowledge of morphology, semantics, collocations, connotations and associations and the use of social and other factors (Nation, 1990, 2001; Richards, 1976; Ringbom, 1987).

While most of the vocabulary tests that rely on knowledge component model measure just one of the subknowledges: meaning comprehension (Nation, 1983), meaning production (Laufer & Nation, 1999), use of vocabulary (Arnaud, 1992) or associations of word (Read, 1993), some other tests, on the contrary, try to measure a number of subknowledges simultaneously (Schmitt, 1999).

Measurement of only one subknowledge makes it possible to test large sample of items representing learner's total vocabulary. These types of test are regarded as

vocabulary size or vocabulary breadth test. Nevertheless, the superficial treatment of items in these tests have been criticized. Alternatively to size tests, depth tests have been favored as they can test several components of knowledge. The disadvantage of these tests is that they can test a limited number of items which does not represent true vocabulary knowledge of the testee.

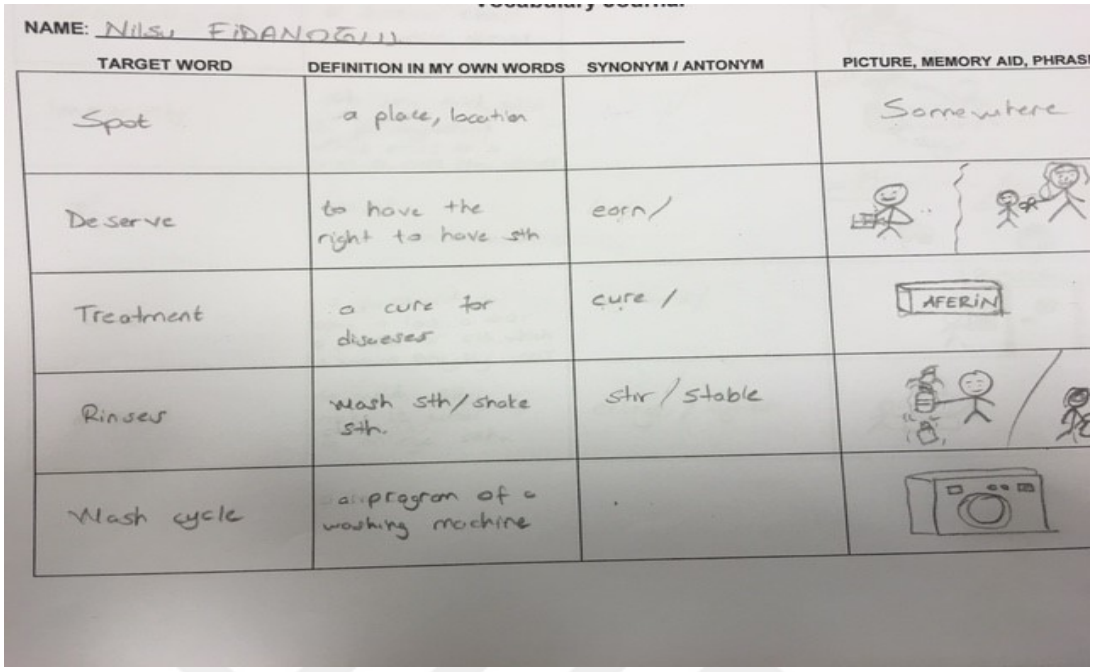
As a conclusion, there have been diverse vocabulary tests and views of researchers regarding their preference for a specific subknowledge and their interest in vocabulary size or depth. In this study, we stand for the vocabulary size tests, although we acknowledge the vitality of vocabulary depth, since size tests have been given importance in predicting achievement in literacy (reading and writing) and general language proficiency besides academic success (Laufer, 1997; Saville-Troike, 1984). Size tests can be used practically as an instrument that gives the researchers vocabulary size of participants before the treatment and displaying growth after the treatment.

In this study, the researcher developed a vocabulary test as a measurement instrument to use in the analysis especially on short-term and long-term vocabulary recall and retention.

e) Vocabulary Journals

As stated above vocabulary journals were supplied to classes B and D as a compensation strategy through a paper-based annotation vocabulary practice. The students in these classes were given the target words traditionally without being exposed to Vocastyle App. They only received Vocabulary Journals in which they are asked to write the definitions of the target words in their own words, synonyms / antonyms and a picture or a memory aid. They were supposed to do it after they were introduced the target words till the following class. Some of the journals made by students are as follows:

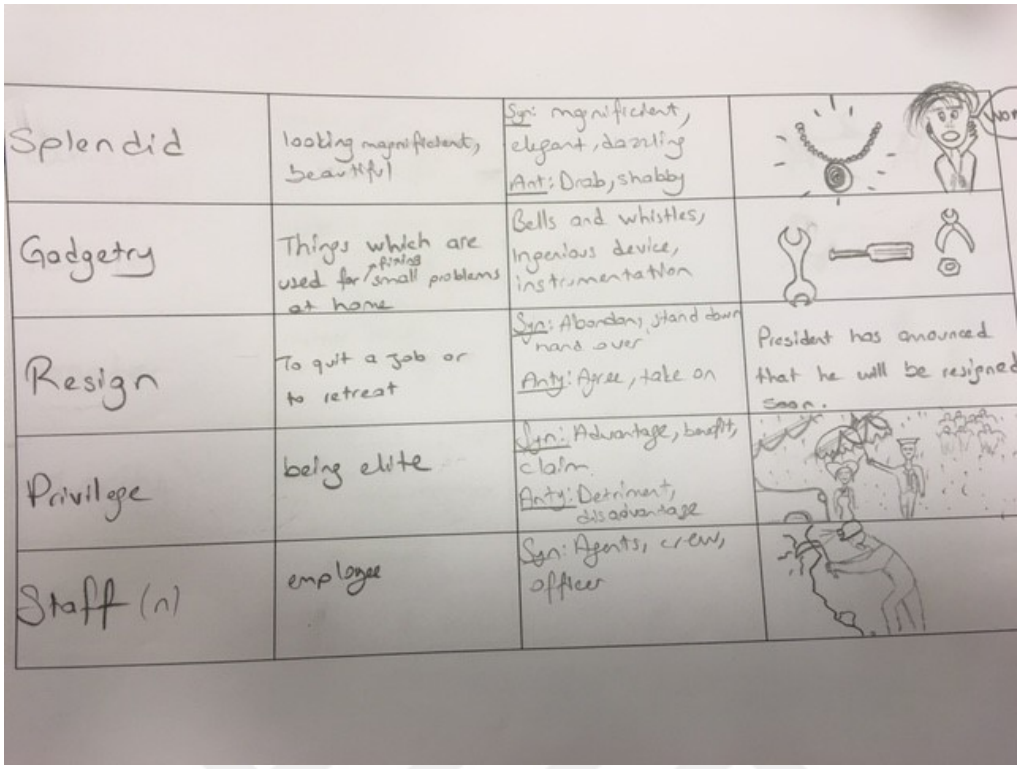
Example 1:



NAME: Nilsu FİDANOĞLU

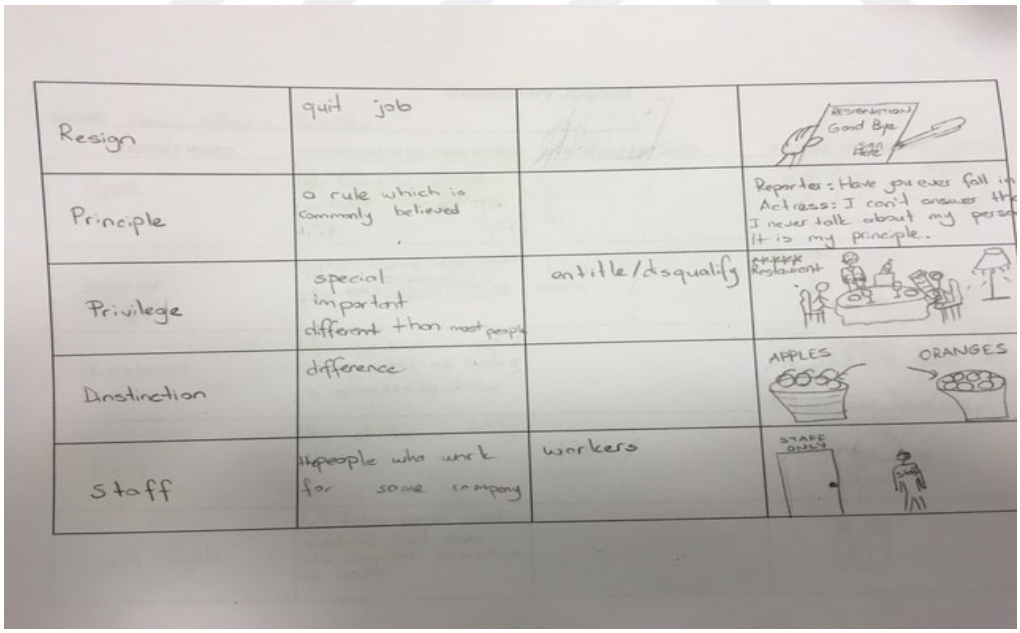
TARGET WORD	DEFINITION IN MY OWN WORDS	SYNONYM / ANTONYM	PICTURE, MEMORY AID, PHRASE
Spot	a place, location		Somewhere
Deserve	to have the right to have sth	earn /	
Treatment	a cure for diseases	cure /	AFERİN
Rinses	wash sth / shake sth.	stir / stable	
Wash cycle	a program of a washing machine	.	

Example 2:



Splendid	looking magnificent, beautiful	Syn: magnificent, elegant, dazzling Ant: Drab, shabby	
Gadgetry	Things which are used for fixing small problems at home	Bells and whistles, ingenious device, instrumentation	
Resign	To quit a job or to retreat	Syn: Abandon, stand down, hand over Ant: Agree, take on	President has announced that he will be resigned soon.
Privilege	being elite	Syn: Advantage, benefit, claim Ant: Detriment, disadvantage	
Staff (n)	employee	Syn: Agents, crew, officer	

Example 3:



Resign	quit job		RESIGNATION Good Bye
Principle	a rule which is commonly believed		Reporter: Have you ever fall in Actress: I can't answer th I never talk about my pers It is my principle.
Privilege	special important different than most people	entitle/disqualify	***** Restaurant
Distinction	difference		APPLES ORANGES
Staff	people who work for some company	workers	STAFF ONLY

3.9. Data Collection Procedure

According with the research questions a number of different data collection instruments were described above. This part includes procedure of data collection in the study including piloting.

Vocastyle Application was piloted in another state school for a week in 2015-2016 academic year. 15 students enrolled in 10^{th} grade in a different state school were exposed to the application. It was seen that the software was working, annotations were ok and the log file could track the movements of the students.

In order to determine the familiarity of the target words and to decide the final version of the vocabulary test, Vocabulary Knowledge Scale was piloted before the actual data collection. 20 students from another state school took the scale and reliability coefficient was calculated 0.76.

Reid's Perceptual Learning Style Questionnaire was piloted among students of another state school. As mentioned earlier it was adapted to vocabulary component. Students were asked what they understand when they read the items. Based on their comments slight modifications were made such as word choices. The scale was translated to Turkish by an expert and then back translated to English by another expert, and a final version was preraped by a native speaker of English by checking whether there is loss of meaning during translation processes. Because of time limitation statistical analysis could not be done for reliability measure.

Another material that was piloted was vocabulary test. This test was applied to the same students whom the Vocastyle App was piloted to. After the application, Cronbach Realibility coefficient was calculated 0.79 which permitted us to keep on our study without any modification.

Right after the piloting was done, firstly, Wesche and Paribakht's VKS was adapted with the possible target words which were chosen with the consensus of state teachers. In the beginning 49 target words were selected from the related units decided earlier. VKS was then applied one month before the treatment to figure out how much familiarity do students have with the target words. The familiar words were excluded and the final version of the target words was formed with 38 words. This version formed vocabulary tests which were used in pretest, posttest and delayed posttest.

Secondly, The adapted form of Reid's Perceptual Learning Style Questionnaire was applied to experimental group (n=49) before the treatment process. This was believed to give us insight on learning styles of participants in experimental group.

Thirdly, the vocabulary pretest was conducted all participating students (n=122) one week before the treatment, pretests were believed the give us the actual level of students before the treatment in all groups. Then study included three groups which are experimental, control and pure control. These three groups were formed with the inclusion of five 10th grade students at a state elementary school in which Fatih Project is applied in Kocaeli, Turkey. While the experimental group was exposed to Multimedia Vocastyle App., the control group was provided vocabulary journals as a compensation through a paper-based annotation vocabulary practice. The pure control received no treatment at all. The treatment process lasted 1 month.

Fourtly, after finalizing the treatment process all groups were given the same vocabulary posttest. Posttest was believed to supply how much progress they made with a month long treatment. Then, delayed posttest was applied one month after the treatment was over. Delayed posttest was supposed to give us how much of target words were retained after a month.

3.10. Data Analysis

3.10.1. Definitions and Measurements of Variables

3.10.1.1. Independent Variables

3.10.1.1.1. Perceptual Learning Styles

It is a categorical variable which has two levels- visual and auditory. Reid's Perceptual Learning Style Preference Questionnaire (PLSPQ) was used in order to measure this variable. The questionnaire was adapted with a specific focus on vocabulary learning.

3.10.1.1.2. Annotation Use

It refers to the number of accesses to annotations by the students. It is a continuous variable. When learners log in to the app after installing it into their smartphones or tablets, the app creates a Log file and tracks all the data. Therefore Log file gave the exact use of annotations by the learners in terms of both the number of use.

3.10.1.2. Dependent Variable (s)

3.10.1.2.1. Short-Term Vocabulary Recall and Long-Term Vocabulary Retention

These are continuous variables, measured via vocabulary tests which were developed by the researcher. Vocabulary tests were developed in Multiple Choice format in a contextualized way.

3.10.2. Data Analysis Procedure

3.10.2.1.Computer Log of Access Time and Number of Annotation Access/Click

The computer log files generated by the user tracking program provided the researcher with data used to explore the number of annotations each participant clicked on

every annotation. The retrieved data from the log files were analyzed using descriptive statistics, namely frequency and percentage. Correlations between access time, the number of annoıtations clicked and students'performance on vocabulary tests were calculated.

3.10.2.2. Students' Performance

To explore the effect of different types of annotations on L2 vocabulary knowledge, a 1 x 4 x 2 factorial design with treatments (treatments vs. control) as a between groups factor, (pre-test vs. post-test vs. delayed post-test) as a within groups factor, was conducted to determine the effectiveness of annotation use on the students' vocabulary recall and word retention.

As mentioned previously there are three subquestion of the first research question. For the first research question "1.a. What are the annotation preferences (text, pictures/graphics, audio, and video) of EFL learners when they are involved in a hypermedia reading text? data was collected through Log files after the treatment.

To clarify, frequency of access to the annotations by each learner according to their learning styles was analyzed with the data derived from log files. Log files were examined with descriptive statistics.

For the second subquestion, "What are the perceptual learning styles of EFL learners when they are involved in a hypermedia reading text?" data was collected through Perceptual Learning Styles Questionnaire (Reid, 1987). The questioannaire data was analysed with descriptive statistics.

For the third subquestion "Is there a relationship between EFL learners' perceptual learning styles (visual and auditory) and annotation preferences (text, pictures/graphics,

audio, and video)?" Data analysis was be done by Chi Square Analysis. This analysis gave us the intercorrelations between annotation use and perceptual learning styles.

In order to examine the second research question "Is there a significant difference among three groups, with multimedia annotation, with paper based annonation and with no annotation, in terms of vocabulary learning and retention? If so, what particular types of annotations do affect vocabulary achievement of target words?" Vocabulary Scores of each group were used. Quantitative data were analysed via Multiple Analyses of Variance. As mentioned above there are two subquestions of the second research question. Accordingly the first subquestion of the second research question examined whether annotation use affect immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment. In the analyses of the data, vocabulary pre-test and an immediate vocabulary post-test scores were used. The data analyses were done with Kruskal Wallis which is a nonparametric version of ANOVA) and separate Mann-Whitney-U tests were conducted to see individual differences among groups. It was thought that the short term recall levels of the students can be determined by the post test.

As for the second sub-research question, the procedure was somewhat similar to that of the previous one. To see the long-term vocabulary retention levels of participants under mobile assisted vocabulary learning environment post-test (just after the treatment) and delayed post-test (one month after the treatment) were applied to the participants. The findings were analyzed through Kruskal Wallis which is a nonparametric version of ANOVA) and separate Mann-Whitney-U tests were conducted to see individual differences among groups. It was thought that the short term retention levels of the students can be determined by the delayed post test.

The purpose of these questions (2a and 2b) was to investigate whether certain annotations (text, pictures/graphics, audio, and video) enhanced vocabulary performance better than others and to investigate whether using annotations more frequently lead to better vocabulary performance and better immediate and long-term vocabulary recall and retention.

CHAPTER 4

FINDINGS

The quantitative data were analysed by SPSS (Statistical Package for Social Sciences for Windows 15.0). Descriptive statistics (arithmetic mean, percentage and standard deviation) were used for the data analysis. The normality tests were conducted for each data to decide whether to apply parametric or nonparametric tests. Due to the fact that n>30, Kolmogorov Smirnov test was applied. According to results of normality tests the following tests were used in related research questions.

To recapitulate there are two main research questions in this study; (1) What are the annotation preferences (text, pictures/graphics, audio, and video) of English as a foreign language (EFL)learners with different learning styles when they are engaged in a MAVL environment? and (2) the effect of annotation use on Mobile Assisted Vocabulary Learning, Recall and Retention. Findings related to these research questions are displayed below.

4.1. Research Question 1a

What are the annotation preferences of EFL learners when they are involved in a hypermedia reading text?

Table 1

Descriptive Statistics for Frequency of Access to Different Types of Annotation Use (N = 49)

Annotation Type	N	Minimum	Maximum	Mean	SD
Text	49	1,27	2,31	1,79	0,21
Audio	49	1,34	7,18	3,82	2,38
Graphic	49	2,35	5,84	3,98	0,98
Video	49	2,44	7,45	5,39	1,48

According to descriptive statistics the students preferred video, graphic, audio and text annotations respectively.

4.2. Research Question 1b

What are the perceptual learning styles of EFL learners when they are involved in a hypermedia reading text?

Table 2

Descriptive Statistics for Perceptual Learning Styles of Students (N = 49)

Perceptual Learning Styles	N	Minimum	Maximum	Mean	SD
Visual	27	1,40	4,60	2,80	0,81
Auditory	22	1,20	4,00	2,56	0,69

According to the descriptive statistics the number of visual learners is more than the number of learners who has auditory learning styles. Although the difference does not

seem significant, it was observed that there is a tendency favoring visual perceptual style compared to auditory perceptual style.

4.3. Research Question 1c

Is there a relationship between EFL learners' perceptual learning styles (visual and auditory) and annotation preferences (text, pictures/graphics, audio, and video) ?

Table 3

Descriptives Regarding Annotation Types in terms of Perceptual Learning Styles

Annotation Type	Perceptual Learning Type	N	Mean	Std. Deviation
Text	Visual	27	1.7655	.21278
	Auditory	22	1.8211	.22313
	Total	49	1.7905	.21700
Audio	Visual	27	1.7790	.52031
	Auditory	22	6.3333	.86033
	Total	49	3.8238	2.38932
Graphic	Visual	27	4.6444	.74238
	Auditory	22	3.1736	.55530
	Total	49	3.9840	.98980
Video	Visual	27	6.1880	.63666
	Auditory	22	4.4270	1.64919
	Total	49	5.3974	1.48076

Table 3 gives the descriptive scores of each learner by their preferred annotation type and preferred learning style as well as their means. According to order of preference,

visual learners (N=27) used mostly video annotations (X=6.18, SD= 0.63), graphic annotations (X=4.64, SD= 0.74), audio annotations (X=1.79, SD= 0.52) and text annotations (X=1.76, SD= 0.21). On the other hand, auditory learners preferred mostly audio annotations (X=6.33, SD= 0.86), video annotations (X=4.42, SD= 1.64), graphic annotations (X=3.17, SD= 0.55) and text annotations (X=1.82, SD= 0.22) respectively. While text and audio annotations were preferred mostly by auditory learners, the number of preference for graphic and video annotations is higher among visual learners.

In order to figure out whether there is a difference among auditory learners and visual learners in terms of preferring annotation types, normality of the data was first checked. As the number of total annotation use is more than 30, Kolmogorov Smirnov test was used. The results of Table 4 shows that mean scores of total annotation use were normally distributed.

Table 4

The Results of Normality Tests of Total Annotation Use

	Total Annotation Use
N	49
Kolmogorov-Smirnov Z	0,122
P	0,067

After the normality test was applied, a two-way Chi-square test was conducted in order to examine whether there is a significant difference between auditory learners and visual learners in terms of accessing annotation types.

Table 5

The results of Chi-Square Test towards Perceptual Learning Styles and Annotation Preferences

Variables	N	df	Chi-Square	p
Perceptual Learning Styles*Annotation Preferences	49	3	10,686	0,014

The results of Table 5 shows that there is a significant difference between auditory learners and visual learners in terms of accessing annotation types (χ^2= 10,686, p= 0, 014< 0,05).

In order to examine which annotation preferences caused significant difference between auditory and visual learners, one way Chi-Square tests were applied. The Chi-Square tests were firstly applied to the visual learners' annotation preferences. The results are presented in Table 6.

Table 6

One way Chi-Square Test Results of Visual Learners' Graphic and Audio Annotations Use

Groups		N	Total	df	Chi-Square	p
Annotation Preferences	Graphic	11	13	1	4,760	0,05
	Audio	2				

The results in Table 6 showed that there was a significant difference between audio and graphic annotations use ($\chi^2_{(1)}$ = 4,760, p< 0,05).

After visual learners, one-way Chi-Square tests were applied to the auditory learners' annotation preferences. The results showed that there were significant differences between use of text and audio annotations, and between audio and graphic annotations. The results are presented in Table 7 and Table 8.

Table 7

One way Chi-Square Test Results of Auditory Learners' Audio and Text Annotations Use

Groups		N	Total	df	Chi-Square	p
Annotation Preferences	Audio	9	11	1	3, 494	0,05
	Text	2				

Table 8

One way Chi-Square Test Results of Auditory Learners' Graphic and Audio Annotations Use

Groups		N	Total	df	Chi-Square	p
Annotation Preferences	Audio	9	11	1	5,920	0,05
	Graphic	2				

The results in Table 7 and Table 8 showed that there were significant differences between audio and text annotations use ($\chi^2_{(1)} = 3{,}494$, $p < 0{,}05$); and between audio and graphic annotations use ($\chi^2_{(1)} = 5{,}920$, $p < 0{,}05$).

4.4. Research Question 2

RQ 2. **Is there a significant difference between three groups in terms of vocabulary learning and retention?**

Table 9

Descriptive Statistics of Pretest, Posttest and Delayed Posttest Vocabulary Achievement Mean Scores of Each Group (N = 135)

	Groups	Mean	Std. Deviation	N
Pretest	Multimedia Annotation	27,22	12,10	49
	Paper-Based Annotation	32,38	11,97	55
	No Annotation	33,19	10,77	31
	Total	30,69	11,96	135
Posttest	Multimedia Annotation	68,20	15,98	49
	Paper-Based Annotation	41,85	11,91	55
	No Annotation	36,29	10,93	31
	Total	50,14	19,16	135
Delayed posttest	Multimedia Annotation	53,18	14,84	49
	Paper-Based Annotation	37,81	10,37	55
	No Annotation	33,06	10,22	31
	Total	41,35	11,81	135

As it is clear in Table 9, posttest scores of multimedia annotation group is higher than pretest scores, posttest scores of paper based annotation group is higher than pretest scores, and posttest scores of no annotation group is higher than pretest scores. Although posttest scores are higher in each group compared to pretest scores, this progress seems more in multimedia annotation group compared to paper based annotation and no annotation. Also, posttest mean score of multimedia annotation group is $\overline{X}$ =68, 20, while it decreases to some extent in delayed-posttest. Posttest mean score of paper based annotation grooup is $\overline{X}$ =41.85, while it decreases to some extent in delayed-posttest, and finally posttest mean score of no annotation group is $\overline{X}$ =36.29, while it decreases slightly in delayed-posttest. Although delayed-posttest scores decrease in each group compared to posttest scores, achievement scores are still higher in multimedia annotation group compared to paper based annotation and no annotation group.

In order to test whether there is a significant difference between three groups in terms of vocabulary learning and vocabulary retention, data obtained from pretest, posttest and delayed posttest mean scores of multimedia annotation group which received Vocastyle Multimedia Annotation treatment, paper based annotation group and pure no annotation group which received only regular instruction were applied to Multivariate Analysis of Variance (MANOVA) test. An assumption of MANOVA, assumption of homogeneity of covariance was checked by The Box's Test of Equality of Covariance Matrices. Box's M (89.146) was significant, p(.000)<(.001) – indicating that there are significant differences between the covariance matrices. In such occasions one of the alternative tests, Pillai's Trace, which is very robost and not highly linked to assumptions about the normality of the distribution of the data, can be an appropriate test to use (Field, 2009). With this test a statistically significant MANOVA effect was obtained, Pillais'

Trace = .773, $F(27.533, 6000)$, $p < .001$. The multivariate effect size was estimated at .387, which indicates that 38.7% of the variance in the dependent variable was accounted. After that MANOVA was conducted.The results are presented in Table 10.

Table 10

The MANOVA test results of Vocabulary Recall and Retention Levels in terms of Groups

	Groups	Sum of Squares	df	Mean Square	F	p	Significant Difference
Corrected Model	Pretest	940,197	2	470,099	3,399	0,036	1-2
	Posttest	25711,143	2	12855,572	72,157	0,000	1-3
	Delayed Posttest	9553,148	2	4776,574	32,274	0,000	

According to the MANOVA results, there are significant differences between mean difference scores of students in each group, revealing the effect of Vocastyle in both vocabulary recall and retention. These results suggest that the learners who used multimedia annotations recalled and learned better than the learners who used paper based annotations and who received no treatment at all. In order to see the effect of annotation use on vocabulary recall and retention among groups, Tukey HSD post hoc test was applied. The results of this test for vocabulary recall levels of students are presented in Table 11 and Table 12.

Table 11

The Tukey HSD test results for Vocabulary Recall Level of Students in Multimedia Annotation Group and Paper Based Annotation Group

	N	$\overline{X}$	Sd	Mean Difference	P
Multimedia Annotation	49	68,20	15,99	26,35	0,000
Paper Based Annotation	55	41,85	11,91		

Table 12

The Tukey HSD test results for Vocabulary Recall Level of Students in Multimedia Annotation Group and No Annotation Group

	N	$\overline{X}$	Sd	Mean Difference	P
Multimedia Annotation	49	68,20	15,99	31,91	0,000
No Annotation	31	36,29	10,94		

According to results significant differences were found between multimedia annotation group and paper based annotation group, and between multimedia annotation group and no annotation group in terms of vocabulary recall levels of students. The Tukey HSD test results for vocabulary retention level of students are presented in Table 13 and Table 14.

Table 13

The Tukey HSD test results for Vocabulary Retention Level of Students in Multimedia Annotation Group and Paper Based Annotation Group

	N	$\overline{X}$	Sd	Mean Difference	P
Multimedia Annotation	49	53,18	14,85	15,37	0,000
Paper Based Annotation	55	37,82	10,38		

Table 14

The Tukey HSD test results for Vocabulary Retention Level of Students in Multimedia Annotation Group and No Annotation Group

	N	$\overline{X}$	Sd	Mean Difference	P
Multimedia Annotation	49	53,18	14,85	20,12	0,000
Paper Based Annotation	31	33,06	10,22		

According to results presented in Table 13 and Table 14, significant differences were found between multimedia annotation group and paper based annotation group, and between multimedia annotation group and no annotation group in terms of vocabulary retention levels of students, as in vocabulary recall levels.

These results suggest that the learners who used annotations more performed better while learners who used annotations less performed worse in vocabulary achievement

delayed posttest. In other words, learners who used annotations have higher recall and retention levels compared to those who used fewer annotations.

As this study focuses mainly on hypermedia annotations and their effect on vocabulary achievement scores of learners, the findings here were discussed with a specific reference to multimedia annotation group, namely, their annotation preferences and post and delayed post vocabulary achievement test scores. Therefore we have two more sub-research questions here:

2.a Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment?

2.b. Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of vocabulary retention under Mobile Assisted Vocabulary Learning environment?

While 2.a seeks to figure out whether there is an effect of annotation use on vocabulary recall, 2.b examines whether there is an effect of annotation use on vocabulary recall.

4.5. Research Question 2a

Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment?

Post-test and delayed post-test scores of multimedia annotation group were checked for normality. Due to the fact that n>30, Kolmogorov Smirnov test was applied. The results are shown in Table 15.

Table 15

The Results of Normality Tests of Post-test and Delayed post-test of Multimedia Annotation Group

	Multimedia annotation group post- test	Multimedia annotation group delayed post-test
N	49	49
Kolmogorov-Smirnov Z	0,143	0,126
P	0,014	0,049

Table 15 shows that the multimedia annotation group post-test scores (p=0,014<0.05) and delayed post-test scores (p=0,049< 0,05) were not normally distributed. Thus, non-parametric analyses were used. For research question 2a and 2b, Kruskal Wallis test was used to examine whether there is a significant difference among three groups in terms of their vocabulary achievement post-test scores and delayed post-test scores according to their annotation use. Then, Mann Whitney U test was used to test possible significant differences among groups.

In order to examine whether there is an effect of mobile assisted annotation use (independent variable) on vocabulary achievement posttest scores of learners (dependent variable), a Kruskal Wallis test was conducted. But, as Kruskal Wallis requires more than two groups within the independent variable, data obtained from annotation use were recoded into three levels as High, Mid and Low multimedia annotation users. While data between 15.93 and 18.09 formed the (3) High Level (N=4, X=92.75, SD= 2.07), data between 14.06 thru 15.92 formed (2) Mid-Level (N=41, X=68.24, SD= 13.54), data between 13.28 and 14.05 formed (1) Low Level (N=4, X=43.25, SD= 2.37). The transformed data were further used in the following Kruskal Wallis and Mann Whitney U analyses.

Table 16

Descriptive Statistics for Annotation Use and Immediate Vocabulary Recall Levels of Multimedia Annotation Group Students (N = 49)

Level of Annotation Use	N	Mean	SD
Low	4	43,25	2,37
Mid	41	68,24	13,54
High	4	92,75	2,07
Total	49	68,20	15,99

According to the statistics above high level of multimedia annotation users scored higher in vocabulary achievement posttest than mid-level users and low level users. It would be reasonable to infer that the means scores increase along with the high use of multimedia annotations.

Table 17

The Descriptive Statistics and Kruskal Wallis Test Results of the Effect of Total Multimedia Annotation Use on Vocabulary Recall Levels of Multimedia Annotation Group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Total Annotation Use	Low	4	43,25	2,37	2	19,962	0,000	Low-Mid
	Mid	41	68,24	13,54				Low-High
	High	4	92,75	2,07				Mid-High

According to the Kruskal Wallis test results, total annotation use caused significant difference on students' vocabulary learning. Mann Whitney U test was applied to the variable of annotation use total number groups. The results of Mann Whitney U tests are presented below, respectively.

Table 18

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Total Multimedia Annotation Use is at Low and Mid-level

Groups		n	$\overline{X}$	Sd	U	P
Total Multimedia Annotation Use	Low	4	43,25	2,37	-3,284	0,000
	Mid	41	68,24	13,54		

Table 19

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Total Multimedia Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	P
Total Multimedia Annotation Use	Low	4	43,25	2,37	-2,337	0,029
	High	4	92,75	2,07		

Table 20

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Total Multimedia Annotation Use is at Mid and High Level

Groups		n	$\overline{X}$	Sd	U	P
Total Multimedia Annotation Use	Mid	41	68,24	13,54	-2,337	0,000
	High	4	92,75	2,07		

The results presented at Table 18, Table 19 and Table 20 showed that there were significant differences between students that use multimedia annotations at low level and mid-level, students that use multimedia annotations at mid-level and high level, students that use multimedia annotations at low level and high level. The highest multimedia annotation group post test scores belong to students that use multimedia annotations at high level. The students that use multimedia annotations at mid-level and low level

followed it respectively. These findings indicate that total multimedia annotation use affected vocabulary achievement post-test scores. Learners with high levels of multimedia annotation use have higher levels of vocabulary learning and this effect is observable among different multimedia annotation use levels.

After testing the effect of total multimedia annotation use on vocabulary learning levels of students, the following analyses were conducted to figure out isolated effects of multimedia annotation types on vocabulary recall levels. Successive Kruskal Wallis tests were conducted for text, audio, graphic and video annotations, respectively. Before conducting Kruskal Wallis tests, data obtained from the use of text, audio, graphic and video annotations were recoded to get three levels in each type of multimedia annotation. Accordingly, data were computed as; (text) 1.27-1.52= Low. 1.53-1.95=Mid. 1.96-2.13=High, (audio) 1.34-2.31=Low. 2.32-5.64=Mid. 5.65-7.18= High, (graphic) 2.35-3.01 Low. 3.02-5.48=Mid. 5.49-5.84=High and (video) 2.44-3.01=Low. 3.02-7.00=Mid. 7.01-7.45 =High.

Table 21

The Descriptive Statistics and Kruskal Wallis Test Results about the Effect of Use of Annotation "Text" on Vocabulary Learning

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Text	Low	6	57,00	8,63	2	4,256	0,119	-
Annotation	Mid	33	65,60	16,07				
Use	High	10	71,03	16,81				

According to the Kruskal Wallis test results, use of "text" annotation did not cause significant difference on students' vocabulary learning.

Table 22

The descriptive statistics and Kruskal Wallis test results about the effect of use of annotation "audio" on vocabulary learning

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Audio	Low	27	57,24	13,41	2	18,441	0,000	Low-High
Annotation	Mid	1	60,00	-				
Use	High	27	75,74	11,87				

According to the Kruskal Wallis test results, use of "audio" annotation caused significant difference on students' vocabulary learning. Mann Whitney U test was conducted to see which groups differed significantly. The results of Mann Whitney U test are presented below.

Table 23

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Audio Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	P
Audio	Low	27	57,24	13,41	-4,025	0,000
Annotation	High	27	75,74	11,87		
Use						

The results on Table 23 showed that there are significant differences between students that use audio annotations at high and low levels. The highest multimedia annotation group post test scores belong to the students that use audio annotations at high level. The students that use audio annotations at mid-level and low level followed it respectively. In other words, the learners who used audio annotations high have higher achievement scores compared to those who are mid and low audio annotation users.

Table 24

The Descriptive Statistics and Kruskal Wallis Test Results about the Effect of Use of Annotation "Graphic" on Vocabulary Learning

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Graphic	Low	12	53,83	11,37	2	23,290	0,000	Low-Mid
Annotation	Mid	27	67,70	13,48				Low- High
Use	High	10	86,80	4,49				Mid-High

According to the Kruskal Wallis test results, use of annotation "graphic" caused significant difference on students' vocabulary learning. Mann Whitney U test was conducted to see which groups differed significantly. The results of Mann Whitney U tests are presented below, respectively.

Table 25

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Graphic Annotation Use is at Low and Mid Level

Groups		n	$\overline{X}$	Sd	U	p
Graphic Annotation Use	Low	12	53,83	11,37	-3,162	0,001
	Mid	27	67,70	13,48		

Table 26

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Graphic Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	p
Graphic Annotation Use	Low	12	53,83	11,37	-3,606	0,000
	High	10	86,80	4,49		

Table 27

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Graphic Annotation Use is at Mid and High Level

Groups		n	$\overline{X}$	Sd	U	p
Graphic Annotation Use	Mid	27	67,70	13,48	-3,742	0,000
	High	10	86,80	4,49		

The results presented at Table 25, Table 26 and Table 27 showed that there are significant differences between the students that use graphic annotations at low level and mid-level, the students that use graphic annotations at low level and high level, the students that use graphic annotations at mid-level and high level. The highest multimedia annotation group post test scores belong to the students that use graphic annotations at high level. The students that use graphic annotations at mid-level and low-level followed it respectively. Put it differently, high graphic annotation users have higher achievement scores compared to those who are mid and low graphic annotation users.

Table 28

The Descriptive Statistics and Kruskal Wallis Test Results about the Effect of Use of Annotation "Video" on Vocabulary Learning

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Video	Low	20	55,60	9,43	2	21,514	0,000	Low-Mid
Annotation	Mid	23	76,00	14,30				Low-High
Use	High	6	80,33	11,18				

According to the Kruskal Wallis test results, annotation use caused significant difference on students' vocabulary learning. Mann Whitney U test was conducted to see which groups differed significantly. The results of Mann Whitney U tests are presented below, respectively.

Table 29

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Video Annotation Use is at Low and Mid Level

Groups		n	$\overline{X}$	Sd	U	p
Video Annotation Use	Low	20	55,60	9,43	-4,119	0,000
	Mid	23	76,00	14,30		

Table 30

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Recall Levels of Students whose Graphic Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	p
Video Annotation Use	Low	20	55,60	9,43	-3,439	0,000
	High	6	80,33	11,18		

The results on Table 28, 29 and Table 30 showed that there are significant differences between the students that use video annotations at low level and mid-level, the students that use video annotations at low level and high level. The highest multimedia annotation group post test scores belong to the students that use video annotations at high level. The students that use video annotations at mid-level and low level followed it respectively. It can be inferred that high video annotation users have higher achievement scores compared to those who are mid and low video annotation users.

With these Mann Whitney U test results, the analysis for this research question was completed. Before continuing with research question 3, delayed post-test scores of multimedia annotation group were checked for normality. Due to the fact that n>30, Kolmogorov Smirnov test was applied. It was found out that delayed post-test scores (p=0,049< 0,05) were not normally distributed. Thus, non-parametric analysis was used for third research question. Kruskal Wallis test was used to examine whether there is a significant difference among three groups in terms of their vocabulary achievement post-test scores and delayed post-test scores according to their annotation use. Then, Mann Whitney U test was used to test possible significant differences among groups.

4.6.Research Question 2b

Is there a significant difference among three groups (High, Mid, Low multimedia annotation users) in terms of vocabulary retention under Mobile Assisted Vocabulary Learning environment?

In order to examine whether there is an effect of mobile assisted annotation use (independent variable) on vocabulary achievement delayed posttest scores of learners (dependent variable), Kruskal Wallis test was conducted. Yet, as it was done in research question 2a previously, Kruskal Wallis requires more than two groups within the independent variable; therefore previously recoded data was also used to find out the answer of the third research question. To reiterate, multimedia annotation use data was recoded into three levels as High, Mid and Low.

Table 31

Descriptive Statistics for Annotation Use and Vocabulary Retention Levels of Multimedia Annotation Group Students (N = 49)

Level of Multimedia Annotation Use	N	Mean	Sd
Low	4	32,25	1,50
Mid	41	52,78	12,43
High	4	78,25	6,50
Total	49	53,18	14,85

According to the statistics above, high level of multimedia annotation users scored higher in vocabulary achievement delayed posttest than mid-level multimedia annotation users and low level users. It would be reasonable to infer that the means scores increase along the more multimedia annotation use. In other words, vocabulary retention level of learners who use multimedia annotations in high level is higher than the learners who use multimedia annotations in mid-level and low level.

Table 32

The descriptive statistics and Kruskal Wallis test results of effects of Total Multimedia Annotations Use on Vocabulary Retention Levels of Multimedia Annotation Group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Total Multimedia Annotation Use	Low	4	32,25	1,50	2	19,936	0,000	Low-High
	Mid	41	52,78	12,43				Low-Mid
	High	4	78,25	6,50				Mid-High

According to the Kruskal Wallis test results, total multimedia annotation use caused significant difference on students' vocabulary retention levels. These results suggest that the learners who used multimedia annotations more performed better than the learners who used multimedia annotations less in vocabulary achievement delayed posttest. Separate Mann Whitney U tests were applied to see the effect of annotation use on vocabulary retention among groups. The results of Mann Whitney U tests are presented below, respectively.

Table 33

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Total Multimedia Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	p
Total Multimedia Annotation Use	Low	4	32,25	1,50	-2,428	0,029
	High	4	78,25	6,50		

Table 34

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Total Multimedia Annotation Use is at Low and Mid Level

Groups		n	$\overline{X}$	Sd	U	P
Total Annotation Use	Low	4	32,25	1,50	-3,281	0,000
	Mid	41	52,78	12,43		

Table 35

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Total Multimedia Annotation Use is at Mid and High Level

Groups		n	$\overline{X}$	Sd	U	p
Total Multimedia Annotation Use	Mid	41	52,78	12,43	-3,281	0,000
	High	4	78,25	6,50		

The results presented at Table 33, Table 34 and Table 35 indicated that that there were significant differences between the students that use multimedia annotations at low level and mid-level, the students that use multimedia annotations at mid-level and high level, the students that use multimedia annotations at low level and high level. Taken together, these results suggest that the learners who used multimedia annotations more performed better while learners who used multimedia annotations less performed worse in vocabulary achievement delayed posttest. Put it differently, learners who used multimedia annotations more have higher retention levels compared to those who used less multimedia annotations.

After finding out the effect of total multimedia annotation use on vocabulary achievement delayed posttest scores, successive Kruskal Wallis tests were conducted to see isolated effects of annotation types (text, audio, graphic and video) on vocabulary achievement delayed posttest scores. Since Kruskal Wallis test necessitates more than three levels, previously recoded data which was used in second research question was used again.

Table 36

The descriptive statistics and Kruskal Wallis test results of effects of Text Annotation Use on Vocabulary Retention Levels of Multimedia Annotation Group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	P	Significant Difference
Text	Low	6	44,33	10,82	2	4,239	0,120	-
Annotation	Mid	33	49,50	13,63				
Use	High	10	55,91	15,28				

According to the Kruskal Wallis test results, text annotation use did not cause significant difference on students' vocabulary retention. These results suggest that the learners who used text annotations more did not perform better than the learners who used annotations less in vocabulary achievement delayed posttest. The highest retention level belongs to the students that use text annotations at high level. The students that use text annotations at mid-level and low level followed it respectively. Taken together, these results suggest that the learners who used annotations more performed better while learners who used annotations less performed worse in vocabulary achievement delayed posttest. But this effect does not seem to be caused by text type of annotations.

Table 37

The descriptive statistics and Kruskal Wallis test results of effects of Audio Annotation Use on Vocabulary Retention Levels of Multimedia Annotation Group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Audio	Low	27	42,00	11,80	2	22,247	0,000	1-3
Annotation	Mid	1	55,00	-				
Use	High	27	60,59	9,06				

According to the Kruskal Wallis test results, audio annotation use caused significant difference on students' vocabulary retention. These results suggest that the learners who used audio annotations more performed better than the learners who used annotations less in vocabulary achievement delayed posttest. Separate Mann Whitney U tests were applied to see the effect of audio annotation use on vocabulary retention among groups. The results of Mann Whitney U tests are presented below, respectively.

Table 38

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Audio Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	p
Audio	Low	27	42,00	11,80	-4,491	0,000
Annotation	High	27	60,59	9,06		
Use						

The results at Table 38 indicated that there is a significant difference between the students that use audio annotations at low level and high level. Taken together, the learners who used audio annotations have higher achievement scores in delayed post-test compared to those who are mid and low audio annotation users. Put it differently, learners who used audio annotations have higher retention levels compared to those who used less audio annotations.

Table 39

The descriptive statistics and Kruskal Wallis test results of effects of Graphic Annotation Use on Vocabulary Retention Levels of Multimedia annotation group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Graphic	Low	12	37,92	4,80	2	28,656	0,000	Low-Mid
Annotation	Mid	27	53,30	12,66				Low-High
Use	High	10	71,20	3,68				Mid-High

According to the Kruskal Wallis test results, graphic annotation use caused significant difference on students' vocabulary retention levels. These results suggest that the learners who used graphic annotations more performed better than the learners who used annotations less in vocabulary achievement delayed posttest. Separate Mann Whitney U tests were applied to see the effect of graphic annotation use on vocabulary retention among groups. The results of Mann Whitney U tests are presented below, respectively.

Table 40

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Graphic Annotation Use is at Low and Mid Level

Groups		n	$\overline{X}$	Sd	U	p
Graphic Annotation Use	Low	12	37,92	4,80	-3,757	0,000
	Mid	27	53,30	12,66		

Table 41

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Graphic Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	p
Graphic Annotation Use	Low	12	37,92	4,80	-3,997	0,000
	High	10	71,20	3,68		

Table 42

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Graphic Annotation Use is at Mid and High Level

Groups		n	$\overline{X}$	Sd	U	P
Graphic Annotation Use	Mid	27	53,30	12,66	-3,909	0,000
	High	10	71,20	3,68		

The results presented at Table 40, Table 41 and Table 42 indicated that that there were significant differences between the students that use graphic annotations at low level and mid-level, the students that use graphic annotations at low level and high level, the students that use graphic annotations at mid-level and high level. Taken together, these results suggest that the learners who used graphic annotations more performed better while learners who used graphic annotations less performed worse in vocabulary achievement delayed posttest. Put it differently, learners who used graphic annotations have higher retention levels compared to those who used less annotations.

Table 43

The descriptive statistics and Kruskal Wallis test results of effects of Video Annotation Use on Vocabulary Retention Levels of Multimedia annotation group Students

Groups		n	$\overline{X}$	Sd	df	χ^2	p	Significant Difference
Video	Low	20	40,35	5,12	2	26,315	0,000	Low-Mid
Annotation	Mid	23	61,00	13,66				Low-High
Use	High	6	66,00	7,64				

According to the Kruskal Wallis test results, video annotation use caused significant difference on students' vocabulary retention levels. These results suggest that the learners who used video annotations more performed better than the learners who used annotations less in vocabulary achievement delayed posttest. Separate Mann Whitney U tests were applied to see the effect of video annotation use on vocabulary retention among groups. The results of Mann Whitney U tests are presented below, respectively.

Table 44

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Video Annotation Use is at Low and Mid Level

Groups		n	$\overline{X}$	Sd	U	p
Video Annotation Use	Low	20	40,35	5,12	-4,592	0,000
	Mid	23	61,00	13,66		

Table 45

The Descriptive Statistics and Mann Whitney U Test Results for Vocabulary Retention Levels of Students whose Video Annotation Use is at Low and High Level

Groups		n	$\overline{X}$	Sd	U	P
Video Annotation Use	Low	20	40,35	5,12	-3,862	0,000
	High	6	66,00	7,64		

The results presented at Table 44 and Table 45 indicated that there are significant differences between the students that use video annotations at low level and mid-level, the students that use video annotations at low level and high level. Taken together, these results suggest that the learners who used video annotations in high group performed better than learners in low group and mid group in vocabulary achievement delayed posttest. Put it differently, learners who used video annotations have higher retention levels compared to those who used less annotations.

CHAPTER 5

CONCLUSION & DISCUSSION

5.1. Introduction

This chapter firstly includes overall conclusion and discussion of the findings for (a) annotation preferences (text, pictures/graphics, audio, and video) of English as foreign language (EFL) learners with different learning styles when they are engaged in a MAVL environment, and (b) the effect of multimedia annotation use on Mobile Assisted Vocabulary Learning, Recall and Retention. The findings with their indications corresponding to learning styles, annotation preferences and vocabulary learning and retention for each research question are discussed in relationship with the existing studies in the literature. Secondly, it also covers pedagogical implications for teaching as well as recommendations for further research and limitations of the study.

5.2. Research Question 1

The first research question was addressed to examine annotation preferences (text, pictures/graphics, audio, and video) of English as foreign language (EFL) learners with different learning styles when they are engaged in a Mobile Assisted Vocabulary Learning environment. This research question has three sub-research questions investigating (a) annotation preferences (text, pictures/graphics, audio, and video) of EFL learners (b) perceptual learning styles of EFL learners and (c) difference between EFL learners' perceptual learning styles (visual and auditory) and annotation preferences (text, pictures/graphics, audio, and video).

5.2.1. Research Question 1a

As mentioned in the previous sections, vocabulary learning software was developed by the researcher to keep track of annotation preferences of EFL learners while they are involved in a hypermedia reading text. Findings obtained from Log files indicated that the students preferred visual annotations (video, graphic) annotations more than any other formats including, audio and text. This finding correlates with a number of studies in the literature. Sakar and Ercetin (2005) conducted a study with 44 intermediate Turkish students studying English for academic purposes (EAP) at a Turkish university. The results demonstrate that the learners preferred visual annotations significantly more than textual and audio annotations. Akbulut (2007) found that the performance of participants in the incidental vocabulary test was significantly better with the help of picture and video annotations. In another study, Al-Seghayer's (2001) found that the dynamic video clip has more impact on teaching unknown vocabulary compared to other modalities (pictures and texts).

Data derived from questionnaires demonstrated that the participants' attitudes toward reading were positively affected by hypermedia reading. This finding is also in line with many studies in literature either directly on multimedia learning or use of annotations in foreign language learning. Türk and Erçetin (2014) found that presenting verbal and visual information simultaneously is more influential and motivating. Ariew and Ercetin (2004) explored whether there is a link between reading comprehension and the use of different types of hypermedia annotations. Hoven and Palalas (2011) concentrated on the mobile-assisted component of English for Specific Purposes course that focused on listening and speaking skills in a Canadian college. It was found out that student had positive attitudes towards using the mobile resources and displayed higher listening and

speaking performances. Frohberg, Goth, and Schwabe (2009) classified 102 mobile projects on learning and noticed that most activities of mobile learning happened across diverse environments, and occurred in places such as classrooms and workplaces. Considering the instructional roles of mobile devices in educational environments, these devices have mostly been regarded, firstly, as stimulative and motivational tools rather than content-carrying digital tools.

On the other hand, the least preferred annotation was text annotation. Even if the preference of learners for audio annotations was not low, it was not as high as graphic annotations. These findings indicate that visual annotations (videos and graphics) seem much more effective in multimedia assisted vocabulary environment compared to audio and text annotations. This finding partly contradicts with the finding of Chun and Plass' (1996) research. In their research, Chun and Plass (1996) examined the effectiveness of annotations with different media types of vocabulary acquisition. They used a multimedia application called CyberBuch. This application was a multimedia application for German reading texts and included annotations associated with text, pictures and videos. The sample of the study included 160 sophomore, German students from three different universities in the United States. The students were measured with different types of hypertext annotations. They were text definition, text and picture, text and video. It was found out that the group that used both text and picture annotations were significantly better than two other groups who consulted the text annotations only, and text and video on a vocabulary test. It seems that although there have been many studies highlighting the dominance of visual annotations, there have been controversial findings as well stressing out that text annotations are also useful. The efficiency of annotation types might depend

on their display status such as simultaneous or linear. Another point is that display of annotation types (text + audio, text + picture, audio+ video, etc.) might give diverse results.

5.2.2. Research Question 1b

The second sub-research question was addressed to investigate perceptional learning styles of EFL learners when they are engaged in hypermedia reading text. Findings obtained from Perceptual Learning Style Questionnaire indicated that the number of visual students is more than the number of auditory learners. This finding might be supported with the findings of the first sub-research question highlighting the higher number of visual annotations users compared to auditory and textual users. This finding will be discussed with the findings of the following research question.

5.2.3. Research Question 1c

The third sub-research question was addressed to investigate whether there was a difference between EFL learners' perceptual learning styles (visual and auditory) and their annotation preferences (text, pictures/graphics, audio, and video). As mentioned previously, Reid (1987) identified learning style preferences as the perceptual channels through which learners like to learn best. These channels are classified into auditory (learning by listening to audios, tapes and people), visual (learning by reading and studying charts, graphics and diagrams), kinaesthetic (learning by physical participation), tactile (hands-on, learning by doing, e.g. doing lab experiments, building models), group (learning by studying with other learners in a group), and individual learning (studying in isolation). However, since this study mainly focused on multimedia annotations and learning styles, only visual and auditory learning styles were taken into consideration for experimental purposes.

Findings obtained from Log files and Perceptual Learning Style Questionnaire indicated that while visual learners preferred mostly video annotations and graphic annotations, auditory learners preferred mostly audio annotations and video annotations mostly. Put it differently, while video and audio annotations were preferred mostly by auditory learners, the number of preference for graphic and video annotations seemed to be higher among visual learners. This finding is in congruence with a number of studies and view of Reid (1987) that there are two main hypotheses about learning styles. While the first hypothesis claims that all learners have their own learning styles and learning strengths and weaknesses, the second hypothesis puts forward that when teaching and learning styles do not match, it causes a frustration, demotivation and failure in the learning environment. Surjono (2015) investigated the effect of multimedia preferences and learning styles on undergraduate student achievement scores in an adaptive e-learning system for electronics course at a major state university in Indonesia. The findings demonstrated that students with similar multimedia preferences and learning styles outscored their friends with dissimilar multimedia preferences and learning styles when they are given the materials related with an online electronics course they take. Another study (Plass, et al. 1998) questioned the possible effects of verbal and visual learning preferences of L2 learners on their learning outcomes. It was concluded in the study that students comprehended the text better when they were provided annotation which is in line with their preferences. It was found that the students using both verbal and visual annotations recalled lexical items more than who had chosen only one type either verbal or visual. Finally, students were found to comprehend the text better when they were given the chance to select their own preferred annotation mode.

Findings also indicated that the use of video, audio and graphic annotations is higher among both visual and auditory learners, but the use of text annotations remained far lower among visual and auditory learners. Although the mean score for the use of text annotation is slightly higher among auditory learners, it did not seem effective on the whole.

Moreover, findings revealed that there are significant differences between auditory learners and visual learners in terms of accessing annotation types. Firstly, findings indicated that there was a significant difference between audio and graphic annotations use among visual learners. This might be interpreted as visual learners preferred graphics more rather than audio annotations which may not be surprising at all. Secondly, there were significant differences between use of text and audio annotations, and between audio and graphic annotations among auditory learners. This finding is may not also be surprising since it would be wise to expect that auditory learners prefer audio annotations more than text and graphic annotations. This finding contradicts with Ross and Schulz (1999) who examined the interrelation between cognitive learning styles (concrete random, abstract random, concrete sequential and abstract sequential) and computer-assisted instruction. They found that dominant learning styles of the participants did not cause a significant difference in interaction patterns of participants with CAI software. The researchers implicated that Computer-Assisted Instruction is effective to some extent but might not be suitable for all types of learners.

The studies and discussion above make us infer that participants can have more learning gains when they are given annotations according to their own preferences (Plass et al., 1998; Liu & Reed, 1994). They show positive attitudes towards classroom environment and towards language learning when they are exposed to multimedia instruction.

Furthermore, it was also indicated that hypermedia environments were found to be as equally influential as classroom environments for different learning styles (Raschio, 1990). However, it was also noted that in spite of high motivational and instructional use as a tool, multimedia annotations may not be appropriate to all types of learners (Ross & Schulz, 1999). For instance among six types of perceptual learning styles only two of them (visual and auditory) were taken into account for experimental purposes which means that learners with tactile, kinaesthetic, group and individual learners were not in the scope of the study in line with the nature of multimedia learning that decreases the generalizability of results.

5.3. Research Question 2

The second research question was addressed to examine whether there is a significant difference among three groups (with multimedia annotation, with paper based annotation and with no annotation) in terms of vocabulary learning and retention, and if so, what particular types of annotations affect vocabulary achievement of target words.

Findings obtained from vocabulary achievement tests indicated that, in pretest condition, the mean score for multimedia annotation group were the lowest of all groups. The mean score for no annotation group was a slightly higher than paper based annotation group. In posttest condition, multimedia annotation group mean score increased drastically, paper based annotation group mean scores increased to some extent and mean score of no annotation group displayed a slight increase compared to pretest condition. Finally, in delayed-posttest condition, there were decrease in varying degrees in all groups but still the highest mean score belongs to multimedia annotation group. Findings revealed that there are significant differences among mean difference scores of students in each group, revealing the effect of Vocastyle in both vocabulary recall and retention. These findings might be interpreted as multimedia annotations and, therefore, Vocastyle software affected

recall levels and retention levels of multimedia annotation group students. Findings also indicate significant differences between multimedia annotation group and paper based annotation group, and between multimedia annotation group and no annotation group in terms of both vocabulary recall levels of students and vocabulary retention levels. These findings suggested that learners who used multimedia annotations recalled more and retained more when compared to learners who received paper-based annotations and learners who received no annotation. The effect of paper based annotations should not be ignored, since there were mean differences both in posttest and delayed-posttest condition between paper based annotation group and no annotation group on the part of paper based annotation group. Although the differences in both conditions were not statistically significant, the progress of those students should not be underestimated. Still, it should also be questioned that in all three conditions, during the treatment all three groups were exposed to traditional learning environment as well as purposeful treatment to multimedia annotation and no annotation groups. It should also be noted that the progress, regardless of groups and treatments, to some extent, might be explained by traditional learning environment as well such as coursebooks, workbooks and additional worksheets delivered by class teachers. Another possible interpretation might be the idea that students in multimedia annotation group and no annotation group might have given additional effort to their studies that they already knew that they had been observed, so not all, but some of the learners might have affected the results slightly. Therefore, some of the progress of learners in multimedia annotation and no annotation group might be explained with Hawthorne effect. Yet, the findings seem still clear about the effect of Vocastyle software, since mean difference scores and significant differences between multimedia annotation

and paper based annotation group, and multimedia annotation and no annotation group is pretty obvious enough to claim that.

The findings above are in line with Dual Code Theory (Paivio, 1990) and Generative Theory of Multimedia Learning Theory (Mayer, 2001). While Dual Coding Theory (DCT) (Paivio, 1990) postulates the idea of pictorial-verbal system for knowledge construction in which a verbal system deals directly with language and a nonverbal (pictorial) system deals with non-linguistic objects, elements, and events, Mayer, Generative Theory of multimedia learning (Mayer, 2001), puts forward that information, both verbal and visual, is accessed consecutively in short-term memory. Then the working memory comes into play as the place where the information is processed with both verbal and visual representations to get a holistic form leading to a more complete understanding of the information. Generally, when language learners are offered both verbal and visual input via multimedia, they choose and arrange helpful information accordingly into different models. Thus, the relationships can be established to construct a kind of structure which is mental and meaningful. In fact, linguistic elements, specifically words, in verbal models offer discrete and linear information, but a holistic and nonlinear type of information is offered by pictures in other models. Therefore, learners can have better comprehension when they incorporate knowledge structures into the related models (Ariew, 2006). The findings above are also in congruence with the findings of the following studies. Chen and Chang (2011) explored the moderating effect of L2 English proficiency upon presentation mode and found that there was no moderating effect since student having dual mode scored performed better than the students who had access only to audio across proficiency levels. In another study, Xu (2010) examined the effect of L1, L2, and L1 + L2 annotations on L2 vocabulary learning and found that L1 annotations

were more effective in enhancing L2 vocabulary learning than L2 and L1 + L2 annotations. In the same line, the study by Hulstijn, Hollander, and Greidanus (1996) lent support to the effectiveness of L1 annotations on enhancing L2 vocabulary learning.

On the other hand the findings of this study contradicts with Cognitive Load Theory which argues that that cognitive capacity in working memory is restricted, so that if a learning task requires too much capacity, learning will be obstructed on the condition that a learning necessitates too much capacity. Similarly, Biçer and Akdemir (2015) examined the influence of multiple content forms use in web-based environments on English vocabulary learning. The findings contradicted The Cognitive Theory of Multimedia Learning (Mayer, 2001) which stresses that providing more than one channel (dual mode) at the same time without any rise in cognitive load and the findings were in line with The Cognitive Load Theory which claims that increasing cognitive load may lead to worse performance in learning especially in cognitively less able students.

After the discussion above including three groups in terms of annotation use and its effect on vocabulary recall and retention levels of learners, the following section involves with two sub-research questions of second research question investigating (a) the effect of annotation use on immediate vocabulary recall under Mobile Assisted Vocabulary Learning environment, (b) the effect of annotation use long-term vocabulary retention under Mobile Assisted Vocabulary Learning environment. The discussion here will include only multimedia annotation group learners.

5.3.1. Research Question 2a

The first sub-research question was addressed to investigate the effect of annotation use on immediate vocabulary recall under Mobile Assisted Vocabulary Learning

environment. The data regarding annotation use was divided in three groups as high annotation users, mid annotation users and low annotation users. The findings indicated that high level of annotation users scored higher in vocabulary achievement posttest than mid-level users and low level users and there were significant differences between students that use annotations at low level and mid-level, students that use annotations at mid-level and high level, students that use annotations at low level and high level. It would be reasonable to infer that the means scores increase along with the higher use of annotations. In other words learners with high level of annotation use learned better compared to those who used annotations fewer and this difference is observable among different annotation use levels.

Findings regarding isolated effects of multimedia annotation on vocabulary learning revealed that text annotation did not seem to cause significant difference on students' vocabulary learning and this was not surprising when remarks of students given above are taken into consideration.

On the other hand, the other types of annotations; audio, graphic and video were found significant in terms of vocabulary recall. Findings revealed that there are significant differences between students that use audio annotations high and low. In other words, the learners who used audio annotations high have higher achievement scores compared to those who are mid and low audio annotation users.

Another finding indicated that there were significant differences between the students that use graphic annotations at low level and mid-level, the students that use graphic annotations at low level and high level, the students that use graphic annotations at mid-level and high level. Put it differently, high graphic annotation users have higher

achievement scores compared to those who are mid and low graphic annotation users. Achievement scores decrease along with less use of audio annotations.

The last finding of this part displayed that there were significant differences between the students that use video annotations at low level and mid-level, and, low level and high level. It can be inferred that high video annotation users have higher achievement scores compared to those who are mid and low video annotation users and achievement scores regresses with lesser use of video annotations.

To wrap up, findings above revealed that multimedia annotation use has significant effect on vocabulary recall levels of learners. Among annotations, this effect seems significant in video, graphic and audio annotations. Although text annotations were reported to be helpful, their effect did not seem significant.

The findings above correlate with a number of studies and view in the literature. Nation (2001) remarked that the use annotations has a number of advantages. First, difficult and presumably authentic texts are presented with no simplification or adaptation. Second, there is no interruption from the reading process and it is more time-saving than dictionary use. Third, learners are supplied accurate meanings preventing them from guessing incorrectly. Lastly, learning might be encouraged with more focusing on annotated words. Another supporting view is that different types of media might be employed by annotations which is not available in traditional ones. To clarify, while hypermedia annotations offer a various kinds of media such as text, audio, video, animations or images to present visual, aural or verbal information traditional annotations can employ only pictorial and textual aids to help the reader's understanding (Chun & Plass, 1996). Traditional annotations might be provided either within the text in the form of marginal annotations or as a list at the end as glossaries, on the contrary, hypermedia

annotations are provided within the text in different forms of multiple media. Therefore, learners can read passages faster with the aid of both print and hypermedia annotations. In terms of studies, Wu (2015) designed a Basic4Android smartphone application (Word Learning-CET6) and explored its impact as a tool in facilitating EFL students learning vocabulary. The findings of the study revealed that the participants using the app significantly outscored their counterparts in the control group in terms of new vocabulary gain scores. Moreover, Lomicka (1998) carried out a pilot study to explore the influence of multimedia annotations on reading comprehension. The study ensures empirical evidence to promote the practicality of multimedia annotation. Finally, the findings of Yeh and Wang's research (2003) also showed that the significance of hypertext annotation use in EFL and vocabulary learning has been influential.

5.3.2. Research Question 2b

The second sub-research question was addressed to investigate the effect of multimedia annotation use on vocabulary retention under Mobile Assisted Vocabulary Learning environment. The data regarding multimedia annotation use was divided in three groups as high annotation users, mid annotation users and low annotation users. The findings indicated that high level of multimedia annotation users scored higher in vocabulary achievement delayed posttest than mid-level multimedia annotation users and low level users. It would be reasonable to infer that the means scores increase along the more multimedia annotation use. Put it differently, vocabulary retention level of learners who use multimedia annotations in high level is higher than the learners who use multimedia annotations in mid-level and low level.

Findings regarding isolated effects of multimedia annotation on vocabulary retention demonstrated that text annotation did not seem to cause significant difference on

students' vocabulary retention levels and this was not surprising when remarks of students given above are taken into consideration as it was the same for vocabulary learning in the discussion above.

On the other hand, the other types of multimedia annotations; audio, graphic and video were found significant in terms of vocabulary recall. Findings indicated that there was a significant difference between the students who use audio annotations at low level and high level. Put it differently, learners who used audio annotations high have higher retention levels compared to those who used less audio annotations.

Another finding displayed that that there were significant differences between the students that use graphic annotations at low level and mid-level, at low level and high level, at mid-level and high level. In other words, learners who used graphic annotations high have higher retention levels compared to those who used less graphic annotations.

The final findings related to vocabulary retention levels of EFL learners indicated that there were significant differences between the students that use video annotations at low level and mid-level, at low level and high level. Put it differently, learners who used video annotations high have higher retention levels compared to those who used less video annotations.

To wrap up, findings above revealed that annotation use has an effect on vocabulary retention levels of learners but this effect seems significant in video, graphic and audio annotations. Although text annotations were reported to be helpful, their effect did not seem significant.

The findings above correlate with a number of studies and view in the literature. Martínez-Lage (1997) claims that computer aided annotations are more effective than traditional ones in terms of having a better overall comprehension of the text as diverse

multimedia annotations such as sounds, images, cultural and geographical references might be used. Texts with hypermedia annotations help learners to make a more global approach to the text. Enabling learners to access the text immediately with no interruption is one of the advantages of hypermedia annotations. They also present information in multiple formats which are more understandable and faster to manage for language learners. In terms of studies, Ko (2012) investigated the effect of L1, L2, and no annotations on vocabulary learning. Ninety university students in Korea were randomly assigned to three groups and were asked to read texts for a reading comprehension test. Then, they took an unexpected multiple-choice vocabulary test, which was repeated again four weeks later. Data analysis revealed that on the immediate vocabulary test the multimedia annotation groups outperformed the no annotation group, however, there was no significant difference between L1 and L2 annotation groups. The same results were obtained in the delayed post-test. The participants showed keen interest in having access to annotations. Interestingly, they favoured L2 over L1 annotations. Yoshii (2006) examined the effect of L1 and L2 annotations on L2 vocabulary learning in a multimedia context. Yoshii's study revealed no significant differences between the L1 and L2 annotations, suggesting that both L1 and L2 annotations could be equally effective for L2 vocabulary learning. Taylor (2006) conducted a meta-analytic research of experiments carried out on the effects of L1 annotations on second language reading comprehension. He concluded that learners provided with L1 annotations through computer comprehended significantly more texts than learners who were provided with traditional, paper based L1 annotations aids.

5.4. Pedagogical Implications

In the light of the conclusions of the study there are a number of implications with respect to aspects multimedia assisted vocabulary learning, multimedia annotations and learning styles.

Firstly, considering that vocabulary learning is an indispensable part of foreign language learning and teaching vocabulary with the help of technology has been regarded as a fruitful and motivational tool. Therefore, material developers should consider that in today's world where technology surrounds us from all aspects, technology, more precisely, multimedia should be integrated into EFL curricula. More specifically, in the light of the results of this study, multimedia annotated vocabulary teaching should be stressed. More coursebooks and supplementary materials should be designed and annotations should be embedded to related parts with great scrutiny. By doing this practitioners and designers should take into account that annotations should be appropriate to the target word. Apart from that the way they are presented, simultaneous or linear, and diverse combinations of annotations (text+picture, text+audio, etc.) should be given in accordance to learning styles of learners. However, as discussed above preparing multimedia annotations for every learning style is not an easy task. Therefore software designer and material developers should work hand in hand to prepare really efficient applications which enable diversity in different types of multimedia annotations for each learning style.

5.5. Limitations of the Study

The present study has a number of limitations. Firstly, the number of participants who took part in the study is limited. Thus, generalizability of the statistical findings here is questionable.

Secondly, treatment lasted only 4 weeks due. Longer period of time allotted to treatment could have given different findings.

Thirdly, delayed posttest was conducted one month after the treatment. A delayed posttest which might have been conducted at a later stage could have given different findings.

Fourthly, this study concentrated on only two perceptual learning styles, visual and auditory. Therefore the findings cannot be generalized to all learning styles.

In addition, the treatment was limited only with 10^{th} grade EFL learners. Treatment to different grades could have given different findings.

Moreover, multimedia annotations were prepared only for two units of a selected coursebook used in state schools. A wider scope with more units covered and with more coursebooks included could have supplied a deeper insight to the study.

Another limitation is that only click time (frequency) or in other word how many times an annotation is accessed was taken into consideration. Time spent on as well as access time could have given a wider perspective to the study.

Furthermore, the results cannot be generalized to other settings as it was conducted in a specific EFL context.

Finally, some of the video annotations have sound while some others don't. This is another limitation that might have affected findings.

5.6. Recommendations for Further Research

In the light of the limitations of the study listed above, the following recommendations for further research might be made. First of all, another study in diverse contexts with more participants, including more units and different coursebooks might give a deeper insight to the problem. Secondly, another study with longer treatment periods

with different grade levels might give different findings. Another recommendation is that another study investigating effects of more learning styles and multimedia annotations on vocabulary learning can be conducted. Another study, which is longitudinal, can be conducted with a delayed posttest given at later stage after treatment might give a chance to examine long term retention levels of EFL learners. Furthermore, another study examining both time spent on annotations and the number of access times would be a wise idea see combined effects of these two factors.

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APPENDIX A: Perceptual Learning Style Preference Questionnaire

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Directions:

People learn in many different ways. For example, some people learn primarily with their eyes (visual learners) or with their ears (auditory learners); some people prefer to learn by experience and /or by "hands-on" tasks (kinesthetic or tactile learners); some people learn better when they work alone while others prefer to learn in groups. This questionnaire has been designed to help you identify the way(s) you learn best – the way(s) you prefer to learn. Decide whether you agree or disagree with each statement. And then indicate whether you:

Strongly Agree (SA)

Agree (A)

Undecided (U)

Disagree (D)

Strongly Disagree (SD)

Please respond to each statement quickly, without too much thought. Try not to change your responses after you choose them. Please answer all the questions.

PERCEPTUAL LEARNING STYLE PREFERENCE QUESTIONNAIRE

	SA	A	U	D	SD
1. When the teacher tells me the meaning of vocabulary I understand better.					
2. I prefer to learn vocabulary by doing something in class.					
3. I learn more vocabulary when I work with others.					
4. I learn more vocabulary when I study with a group.					
5. In class, I learn vocabulary best when I work with others.					
6. I learn vocabulary better by reading what the teacher writes on the chalkboard.					
7. When someone tells me how to use a vocabulary in class, I learn it better.					
8. When I do things in class, I learn vocabulary better.					
9. I remember vocabulary I have heard in class better than vocabulary I have read.					
10. When I read a vocabulary, I remember it better.					

11. I learn vocabulary better when I can make a model of it.					
12. I understand vocabulary better when I read it.					
13. When I study alone, I remember vocabulary better.					
14. I learn more vocabulary when I make something for a class project.					
15. I learn vocabulary better when I make drawings as I study.					
17. I learn vocabulary better in class when the teacher gives a lecture.					
18. When I work alone, I learn vocabulary better.					
19. I understand vocabulary better in class when I participate in role-playing.					
20. I learn vocabulary better in class when I listen to someone.					
21. I enjoy working on a vocabulary assignment with two or three classmates.					
22. When I build something, I remember vocabulary I have learned better.					
23. I prefer to study vocabulary with others.					

24. I learn vocabulary better by reading than by listening to someone.					
25. I enjoy making something related with vocabulary learning for a class project.					
26. I learn vocabulary best in class when I can participate in related activities.					
27. In class, I study vocabulary better when I work alone.					
28. I prefer working on vocabulary projects by myself.					
29. I learn more vocabulary by reading textbooks than by listening to lectures.					
30. I prefer to study vocabulary by myself.					

SELF-SCORING SHEET

Instructions

There are 5 questions for each learning category in this questionnaire. The questions are grouped below according to each learning style. Each question you answer has a numerical value:

SA	A	U	D	SD
5	4	3	2	1

Fill in the blanks below with the numerical value of each answer. For example, if you answered Strongly Agree (SA) for question 6 (a visual question), write a number 5 (SA) on the blank next to question 6 below.

Visual 6 - __ 5__

When you have completed all the numerical values for Visual, add the numbers. Multiply the answer by 2, and put the total in the appropriate blank. Follow this process for each of the learning style categories. When you are finished, look at the scale at the bottom of the page; it will help you determine your major learning style preference(s), your minor learning style preference(s), and those learning style(s) that are negligible.

VISUAL	TACTILE
6 - _____	11 - _____
10 - _____	14 - _____
12 - _____	16 - _____
24 - _____	22 - _____
29 - _____	25 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)

AUDITORY	GROUP
1 - _____	3 - _____
7 - _____	4 - _____
9 - _____	5 - _____
17 - _____	21 - _____
20 - _____	23 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)

KINESTHETIC	INDIVIDUAL
2 - _____	13 - _____
8 - _____	18 - _____
15 - _____	27 - _____
19 - _____	28 - _____
26 - _____	30 - _____
Total_____ x 2 = _____(Score)	Total_____ x 2 = _____(Score)

Major Learning Style Preference	38-50
Minor Learning Style Preference	25-37
Negligible	0-24

EXPLANATION OF LEARNING STYLE PREFERENCES

Students learn in many different ways. The questionnaire you completed and scored showed which ways you prefer to learn English. In many cases, students' learning style preferences show how well students learn material in different situations.

The explanations of major learning style preferences below describe the characteristics of those learners. The descriptions will give you some information about ways in which you learn best.

VISUAL MAJOR LEARNING STYLE PREFERENCE

Your learn well from *seeing words* in books, on the chalkboard, and in workbooks. You remember and understand information and instructions better if you read them. You don't need as much oral explanation as an auditory learner, and you can often learn alone, with a book. You should take notes of lectures and oral directions if you want to remember the information.

AUDITORY MAJOR LEARNING STYLE PREFERENCE

You learn from hearing words spoken and from oral explanations. You may remember information by reading aloud or moving your lips as you read, especially when you are learning new material. You benefit from hearing audio tapes, lectures, and class discussion. You benefit from making tapes to listen to, by teaching other students, and by conversing with your teacher.

KINESTHETIC MAJOR LEARNING STYLE PREFERENCE

You learn best by experience, by being involved physically in classroom experiences. You remember information well when you actively participate in activities, field trips, and role-playing in the classroom. A combination of stimuli-for example, an audio tape combined with an activity-will help you understand new material.

TACTILE MAJOR LEARNING STYLE PREFERENCE

You learn best when you have the opportunity to do "hands-on" experiences with materials. That is, working on experiments in a laboratory, handling and building models, and touching and working with materials provide you with the most successful learning situation. Writing notes or instructions can help you remember information, and physical involvement in class related activities may help you understand new information.

GROUP MAJOR LEARNING STYLE PREFERENCE

You learn more easily when you study with at least one other student, and you will be more successful completing work well when you work with others. You value group interaction and class work with other students, and you remember information better when you work with two or three classmates. The stimulation you receive from group work helps you learn and understand new information.

INDIVIDUAL MAJOR LEARNING STYLE PREFERENCE

You learn best when you work alone. You think better when you study alone, and you remember information you learn by yourself. You understand new material best when you learn it alone, and you make better progress in learning when you work by yourself.

MINOR LEARNING STYLES

In most case, minor learning styles indicate areas where you can function well as a learner. Usually a very successful learner can learn in several different ways.

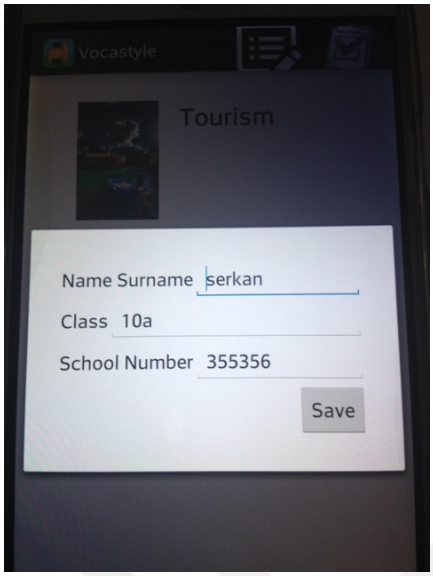
NEGLIGIBLE LEARNING STYLES

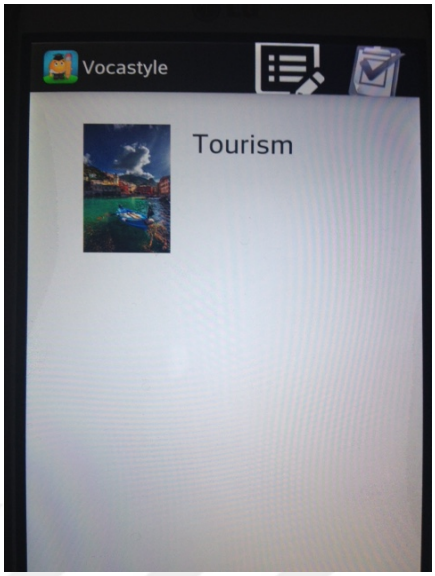
Often, a negligible score indicates that you may have difficulty learning in that way. One solution may be to direct your learning to your stronger style. Another solution might be to try to work on some of the skills to strengthen your learning style in the negligible area.

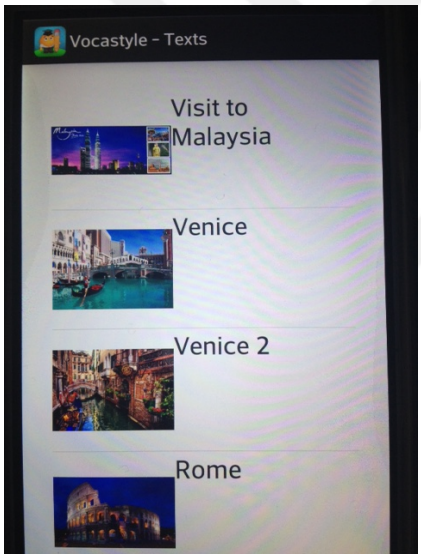
Adapted from the (Reid, J.1995) Learning Styles in the EFL/ESL Classroom. Heinle & Heinle publisher.

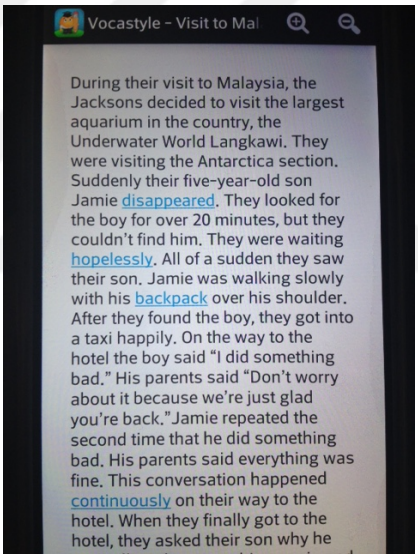
(Permission Request Sent, Awaiting for Approval)

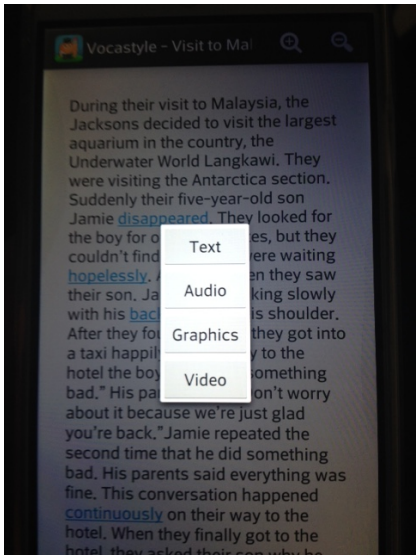
APPENDIX B: Some Snapshot from MAVL Software

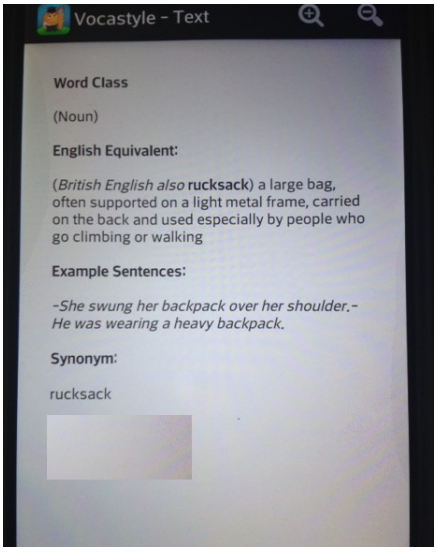


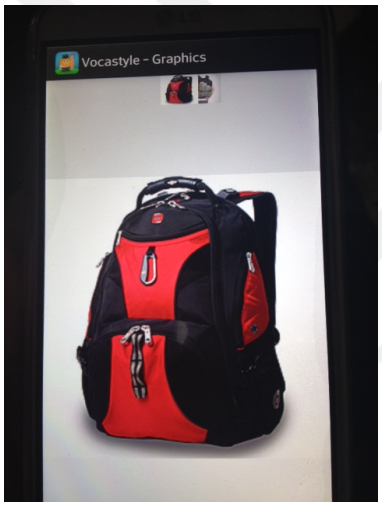


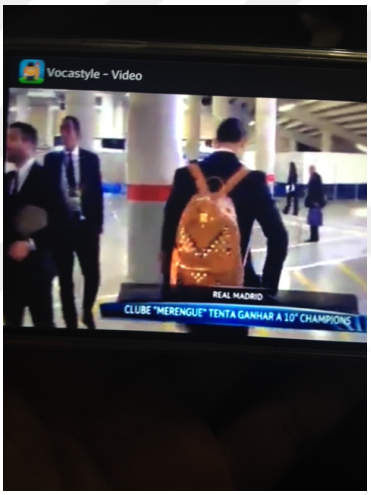





Vocastyle - Visit to Mal
During their visit to Malaysia, the Jacksons decided to visit the largest aquarium in the country, the Underwater World Langkawi. They were visiting the Antarctica section. Suddenly their five-year-old son Jamie disappeared. They looked for the boy for o es, but they couldn't find ere waiting hopelessly. A n they saw their son. Ja king slowly with his bac s shoulder. After they fo they got into a taxi happil to the hotel the boy omething bad." His pa on't worry about it because we're just glad you're back."Jamie repeated the second time that he did something bad. His parents said everything was fine. This conversation happened continuously on their way to the hotel. When they finally got to the
Text
Audio
Graphics
Video


Vocastyle - Text
Word Class
(Noun)
English Equivalent:
(British English also rucksack) a large bag, often supported on a light metal frame, carried on the back and used especially by people who go climbing or walking
Example Sentences:
-She swung her backpack over her shoulder.-
He was wearing a heavy backpack.
Synonym:
rucksack


Vocastyle - Graphics


Vocastyle - Video
REAL MADRID
CLUBE "MERENGUE" TENTA GANHAR A 10ª CHAMPIONS

APPENDIX C: SÖZCÜK BİLGİSİ DEĞERLENDİRME ÖLÇEĞİ

Açıklama: Aşagıdaki sözcükleri tanıma düzeyinizi verilen ölçeğe uygun bir şekilde belirtiniz.

Adı Soyadı :

Numarası:

1. Bu sözcüğü daha önce gördüğümü hatırlamıyorum.
2. Bu sözcüğü daha önce gördüm ama anlamını hatırlamıyorum.
3. Bu sözcüğü daha önce gördüm ve **bence** …….. anlamına gelmektedir (**İngilizce eş anlamlısı veya Türkçe karşılığı**).
4. Bu sözcüğü **biliyorum**. …….. anlamına gelmektedir (**İngilizce eş anlamlısı veya Türkçe karşılığı**).
5. Bu sözcüğü cümle içerisinde kullanabilirim. Örn.

   ……

(**Bu seçeneği seçtiyseniz, lütfen 4. maddeyi de cevaplayınız.**)

1	**Tiny**	1 ( ) 2 ( ) 3 ( ) ..... 4 ( ) .....
	( )	
2	**Inspirational**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
3	**Researcher**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
4	**Splendid**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
5	**Incredible**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
6	**Invent**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
7	**Look after**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
8	**Humanity**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
9	**Grow up**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
10	**Develop**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
11	**Gadgetry**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
12	**Enroll**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
13	**Impressed**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
14	**Resign**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		

15	**Principle**	1 ( ) 2 ( ) 3 ( ) ..... 4 ( ) .....
5 ( )		
16	**Privilege**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
17	**Distinction**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
18	**Institution**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
19	**Vacation**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
20	**Absolutely**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
21	**Staff**	1 ( ) 2 ( ) 3 ( ) ....4 ( ) .....
5 ( )		
22	**Attach**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
23	**Count**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
24	**Complain**	1 ( ) 2 ( ) 3 ( ) ....4 ( ) .....
5 ( )		
25	**Disaster**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
26	**Claim**	1 ( ) 2 ( ) 3 ( ) ..... 4 ( ) .....
5 ( )		
27	**Unfortunately**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
28	**In addition**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....
5 ( )		
29	**Advisors**	1 ( ) 2 ( ) 3 ( ) .... 4 ( ) .....

5 ( ) ……		
30	**Recommend**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
31	**Look forward to**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
32	**Compensation**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
33	**Orphanage**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
34	**Gather**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
35	**Fascinate**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
36	**Improve**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
37	**Communicate**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
38	**Overcome**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
39	**Moreover**	1 ( ) 2 ( ) 3 ( ) …… . ……. 4 ( ) ……
5 ( ) ……		
40	**Hold**	1 ( ) 2 ( ) 3 ( ) …… 4 ( ) ……
5 ( ) ……		
41	**Participate**	1 ( ) 2 ( ) 3 ( ) ……. …… 4 ( ) ……
5 ( ) ……		
42	**Tournament**	1 ( ) 2 ( ) 3 ( ) ……. ……. 4 ( ) ……
5 ( ) ……		
43	**Patronage**	1 ( ) 2 ( ) 3 ( ) ……. ……. 4 ( ) ……
5 ( ) ……		

44	**Compete**	1 ( ) 2 ( ) 3 ( ) ……. ……. 4 ( ) …….
5 ( ) ……		
45	**Various**	1 ( ) 2 ( ) 3 ( ) ……. ……. 4 ( ) …….
5 ( ) ……		
46	**Excitement**	1 ( ) 2 ( ) 3 ( ) ……. .. …….4 ( ) …….
5 ( ) ……		
47	**Competition**	1 ( ) 2 ( ) 3 ( ) ……. ……. 4 ( ) …….
5 ( ) ……		
48	**Participant**	1 ( ) 2 ( ) 3 ( ) ……. ……. . 4 ( ) …….
5 ( ) ……		
49	**Achievement**	1 ( ) 2 ( ) 3 ( ) ……. …… ..4 ( ) …….
5 ( ) ……		

APPENDIX D

VOCABULARY TEST

Name-Surname: _____ **Class:_____**

Please fill in the blanks with the most appropriate word(s) given in the options

1. His toy motorcycle _____ away and fell down from 9th floor, because he couldn't use its remote control.

a) wheeled b) passed c)got d) ran

2. The instructions say the length of _____ is between 25 and 30 minutes when you put your laundries in the machine.

a) ironing service b)drag rope c) wash cycle d) washing line

3. The president was _____ popular, most of the people supported her during the last election, but they did not support her during the previous election.

a) badly b) immensely c) acutely d) terribly

4) I have a homework for tomorrow, but my computer _____ . It's broken and I don't know what to do. Can I borrow your computer, please?

a) fragmented b) smashed c) shattered d)crashed

5) Workers will _____ and stop working if they don't have a contract by noon tomorrow.

a) go on strike b) lock out c) shutout d) picket

6) Please press that _____button on the clock, because I could not sleep well last night.

a) time b) snooze c) setting d) mode

7) Where do you want me to put this sofa in the living room? Can you show a _____ to place it?

a) spot b) land c) mark d) yard

8) _____ the clothes with cold water after washing. You will see they will be cleaner.

a) Iron b) Soak c) Dry d) Rinse

9) They went to a marriage _____ , because they did not want to get divorced.

a) counselor b) lawyer c) officer d) partner

10) Please leave here, You cannot _____ the party as people under 18 are not allowed to do so.

a) hold b) attend c) perform d) conduct

11)Tom's condition is _____ . He was in a hospital room yesterday, but he is in intensive care unit now.

a) stable b) declining c) deteriorating d) depreaciating

12) If you're not delighted with your purchase, we guarantee to _____your money in full.

a) withdraw b) save c) refund d) discount

13) A _____ is a type of lightweight boat that is powered by an engine.

a) catamaran b)sail c) cargo ship d) motorized canoe

14) We stayed in a mountain _____ which was very comfortable during our holiday. It was a lovely place for accommodation.

a) scenery b) lodge c) landscape d) route

15) A: My battery is _____ but I need to call a friend now..Can I make it from your phone?

B: I'm sorry, I forgot my phone at work, but you can charge your phone over there..Here is the charger.

a) flat b) full c) broken d) flush

16) Institutions like _____ are very important. They hold many organizations and collect donations to provide practical help for homeless people.

a) schools b) unions c)charities d) political parties

17) Can I have a _____of coke please? I don't like the bottle one.

a) package b) bar c)bag d) can

18) Police warned the _____ firstly, and then arrested most of them during the protests in 5th Avenue.

a) activists b) assassins c) kidnappers d) burglars

19) We have a number of different size of _____. To make a good strike and to put the ball into the hole in golf course, you need to choose the appropriate one.

a) bats b) gloves c) bars d) clubs

20) The old _____ laws are still being taught by the US Golf Schools Organization.

a) ball flight b) cricket c) hockey d) baseball

21) The _____ is a modified form of baseball and it is played on a smaller field with a larger ball.

a) volleyball b) badminton c)softball d) rugby

22) The _____ is the player who throws the baseball towards the opposing team player to begin each play.

a) catcher b) pitcher c) batter d) keeper

23) We've seen great improvement in David's confidence, social skills and study skills. _____ , he has perfect motivation in his job.

a) So b) Nevertheless c) Then d) Moreover

24) One should finish high school to _____ a university.

a) enroll at b) subscribe c) check in d) log in

25) You are one of elite customer, so you have a lot _____such as large rooms with beautiful sea view, quality room service, free wi-fi, sauna, free pass to casino.

a) exemptions b) grants c) privileges d) entitlements

26) Anne and Alex are very great dancers. _____, they can sing and act.

a) So b) Thus c) Then d) In addition

27) Some of the customers did not find the hotel services satisfactory. They said they would not recommend the hotel anyone else and wanted their money back, so they asked for _____ payment.

a) compensation b)regular c) late d) part

28) Under the _____ of UNESCO many nations can join Olympic Games this year. The funding will be done by UNESCO.

a) principles b) patronage c) protection d) advocacy

29) In the next Wolrd Football Championship 32 teams from all over the world will _____each other to win the World Cup.

a) fight b) collide c) bid d) compete

30) Rocky _____ that he is the best boxer of his time, noone can beat him.

a) claimed b) argued c) advised d) asserted

31) My vacation in your camp made me very unhappy. There were no _____ around when I need them for guidance. I felt totally helpless.

a) lawyers b) authors c) doctors d) advisors

31. Jasmine is Prime Minister's primary _____. Prime Minister trusts her a lot and listens to what she recommends.

a) lawyer b) secretary c) guard d)advisor

32) Bertha **:** The Italy trip was really exciting.

Reporter **:** But it was a busy and tiring week, wasn't it?

Bertha **:** Yes, it was, but we also had free time for a _____ trip to Venice too.

a) round b) single c) splendid d) premium

33) In 1984, Steve Jobs _____ Apple to open a new company called Next.

a) claimed for b) resigned from c) remained to d) returned back

34) **Reporter** : Which one is the most important in your life? Music or arts?

Singer: It is really hard to make a (an)_____ between the two. I love both of them.

a) divergence b) distinction c) otherness d) dissimilarity

35) **Jamie**: I am highly interested in animals. Therefore, I would like to be a volunteer in Caretta Research Project. I think it is the right job for me.

Jane : Yeah, sounds great.. I have _____ a similar volunteer job in Fethiye, Turkey and I have big plans for Caretta Carettas.

a) participated in b) decided on c) abandoned d) connected to

36) The festival was great. We saw many singers and music bands from different countries and _____ music kinds.

a) separate b) similar c) various d) discrete

37) All _____ should sign the attendance list over here. You will get a certificate after the conference presentations are over.

a)customers b) partners c) clients d) participants

38) If the _____ can't hit the baseball, the opposing team player catches the baseball and throws it back to his teammate.

a) catcher b) batter c) pitcher d)keeper