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## PREFACE

With the transformation of information technology, the way we learn and teach changes altering the situation of both teachers and students resulting in developing new methods of learning and teaching. Today, learners and teachers have quick access to various materials for language learning and teaching. The virtual reality has been one these technologies offering educators a way to improve the process of learning. In this context, the current study was launched to test the effectiveness of VR tools in vocabulary learning and retention and the outcomes of the research was presented in the following chapters.

I would like to thank to my advisor Assist. Prof. Dr. Tuncer Can, who gave the idea to study in this field. I am so grateful to him for his continuous help, excellent suggestions, encouragements, and guidance throughout the stages of this thesis.

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**Ruhsar KOÇBUĞ**

# ÖZET

## Sanal Gerçeklik Araçlarının Kelime Öğrenimi ve Hafızada Tutmadaki Verimliliği

Günümüzde eğitim geleneksel öğretim yöntemlerinin ötesine geçmeye başlamıştır. Öğrencilerin öğrenme deneyimlerini artırmak için bilgisayar teknolojilerinden faydalanılmaktadır. Hızlı gelişen teknoloji sayesinde, dokunmatik dijital teknolojiler eskimiş ve artık *dokunmadan* etkileşim gündeme gelmiştir. Teknolojideki yeniliklerin çekiciliği, öğretmenlere eğitimde yeni yaklaşımları denemek için yeni fikirler sunmaktadır. Sanal gerçeklik, öğrencilerin karmaşık konuları kolaylıkla ve eğlenceli bir şekilde öğrenmelerini sağlayan önemli bir teknolojidir. Yapılan çalışma, bu sanal gerçeklik araçlarının kelime öğrenimi ve kalıcılığı üzerindeki etkililiğini inceleyen niceliksel bir araştırma sunmaktadır. Yapılan çalışma, deney ve kontrol grubu olmak üzere iki grup ile gerçekleştirilmiştir. Deney grubuna sanal gerçeklik araçları ile öğretim uygulanırken, kontrol grubuna sanal gerçeklik araçları olmadan geleneksel öğretim uygulanmıştır. Bu uygulamada öğrenme kazanımları arasında neden ve sonuç ilişkisi kurmak için ön test, son test ve takip testi kullanılmıştır. Katılımcıların sanal gerçeklik araçlarıyla yapılan öğretime ilişkin fikirlerini almak için öğretim materyalleri motivasyon anketi uygulanmıştır. Araştırma sonuçları, sanal gerçeklik araçlarının kelime öğrenmede ve akılda tutmada etkili olduğunu göstermiştir. Ancak, sanal gerçeklik araçları ile destekli öğretimin eğitimsel etkililiği açısından çalışmaya katılan gruplar arasında anlamlı bir fark bulunamamıştır. Son-test ve takip testi sonuçlarına göre, deney grubunun kontrol grubundan yaklaşık dokuz ve on puan aşağıda olduğu tespit edilmiştir. Bu sonucun ortaya çıkmasında, deney grubu öğrencilerinin yaş ortalamasının kontrol grubu öğrencilerine kıyasla daha yüksek olmasının etkili olduğu düşünülmüştür. Anket sonuçlarına göre, katılımcılar sanal gerçeklik araçlarıyla yapılan dersleri zevkli buldular ve derslerin dikkat çekici olduğunu belirttiler.



**Anahtar kelimeler**: Sarmal Sanal Gerçeklik araçları, karton sanal gözlük, kelime öğrenimi, kelime öğretimi, öğrenci motivasyonu

## ABSTRACT

### The Effectiveness of Virtual Reality Tools on Vocabulary Learning and Retention

Today, the field of education has begun to go beyond the traditional teaching methods. Computer technology and its components are utilized to enhance students' learning experiences. With the fast developing technology, interaction *without touching* has come up in recent days. The attractiveness of the latest technology gives teachers new ideas to try new approaches in education. Virtual Reality is seen as a significant evolving technology that allows students to learn complex subjects with ease and fun. This study presents a quantitative research that examines the effectiveness of Virtual Reality tools on learning and storage of the words. To obtain the results, the study was carried out with two groups. While the experimental group was taught with Virtual Reality tools, the control group had traditional teaching without Virtual reality tools. The pre-test, post-test and follow-up test were put to use to form a cause and effect relationship between the interventions and learning outcomes. To find out opinions of the participants an instructional materials motivation questionnaire was applied. The results of research showed that Virtual Reality tools are effective in learning and retention of vocabulary, yet there is no significant difference in educational effectiveness of Virtual Reality tools supported instruction between the groups participating in the study. According to the results of the post-test and follow-up test, it was determined that the experiment group scored about nine and ten points below the control group. It was thought that this result emerged because the age average of the experimental group was higher than those of control group students. According to the questionnaire, the participants enjoy the lessons with Virtual Reality tools and the lessons attracted attention.



**Key words**: Immersive Virtual Reality tools, Google Cardboard, vocabulary learning, vocabulary teaching, students' motivation,

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# PART I: INTRODUCTION

## 1.1. Introduction

In the first chapter, statement of the problem, and research questions will be presented, the significance, assumptions and limitations of the study will be discussed, and definitions of the terms will be given.

## 1.2. Statement of the Problem

Emerging technology offers new ideas every day to foreign language education. Instructors who are looking for more effective ways of learning in foreign language education try to adapt to the opportunities offered by technology. Computers, the internet, smart boards and smart phones serve this area offering a newer technology every day. Especially, the fact that the internet has an important place in every area in daily life has increased the importance of these technological resources.

Some of these technological resources are three-dimensional (3D), multi-users virtual environments, games and web technologies that offer different types of information which are suitable for the development of a variety of activities in educational settings (Elmas & Geban, 2012). With the ever-expanding reach of broadband communications, sound, video and wireless technology, and the ever-increasing availability of multimedia and other applications, virtual worlds have become more practical and usable (Dalgarno & Lee, 2010; Dickey, 2005a; Warburton, 2010; Bulu & İşler, 2011). Thanks to these new technologies and applications, learning styles are changing (Yalın, 2007). In order to fulfill the requirements of the network-based society in the digital age, teachers are in a struggle to develop new strategies in teaching and learning.

These new opportunities, called 3D Virtual Reality (VR) applications, help educators fill the gap between reality and abstract knowledge. VR applications are not only effective in interpreting scientific concepts, but also in keeping concepts in the long term memory. Such VR applications are seen as an important element for success in teaching foreign languages, where it is important to encourage student participation and to keep things in memory. (Lee, J. 1999). Nonis (2005) reported

that students are more integrated in all of the areas in education where 3D VR is used. The inclusion of games with 3D VR raises the motivation levels of the students and supports the constructivist approach. Yet, it is important to bear in mind that the reasons such as features of students, interaction capability, and involvement in learning can act on the consequences of learning (Salzman, et al., 1999; Wan, et al., 2007).

First-hand learning, a form of experiential learning, is the unique and most powerful feature of 3D VR in language learning (Chee, 2001). Unfortunately, today's schooling is based on information from third-person that determines learning preferences of the pupils and the way they internalize the knowledge, without directly experiencing (Winn, 1993). It has been observed that the qualitative results of first and third person learning differ. In the third-person learning the learning is generally shallow and has a low rate of memory retention (Chee, 2001).

Virtual worlds are structured environments in which the students create, direct and control all aspects of digital knowledge according to their needs (Chee, 2001). The cognitive constructivist approach draws attention to the process by which learners interacts with the social and physical environment to make sense of the information and direct experiences with the actual materials and cooperation with the environment. (Piaget & Inhelder, 1971; Vygotsky, 1978). With VR, students find themselves in real environments and learn the language in a learning environment that they control.

To sum up, the main issue in education is finding ways to enhance the gains that are likely to be obtained from instruction. Hence, a considerable amount of research has been carried out to discover new teaching means in educational technology. The use of VR tools in instructional settings is one of these ways that is expected to assist learning. However, it is seen that there is still lack of enough evidence to testify the effectiveness of VR tools and, specifically how effective they are in education and especially in second language learning. Another obstacle in this field is lack of interest and investment in VR tools for educational purposes by designers and creators of this technology.

### 1.3. Research Questions

To analyze the effectiveness of VR tools on vocabulary learning and retention, the research questions below have been posed.

1. What are the effects of VR tools on vocabulary learning?
    a. Is there a noteworthy distinctness between control and experimental group in the pre-test scores?
    b. Is there a noteworthy distinctness between control and experimental group in the post-test scores?
2. What are the effects of VR tools on vocabulary retention?
    a. Is there a noteworthy distinctness between control and experimental group in the follow-up test scores?
3. How are students' attitudes towards VR tools?
    a. When you first learned the course contents, did you think that there is an interesting thing which attracts attention?
    b. Did you enjoy studying in the lessons with the use of these materials?

### 1.4. Significance of the Study

Traditional methods are losing their popularity whereas VR applications stimulate new excitement in education. According to the PISA 2012 report, the level of student achievement in Turkey is low compared to other OECD countries. It is foreseen that this new technological approach will contribute to education. If this technology is to go further and be thought to push the boundaries of the mind, it will be inevitable to use it in the future. Furthermore, the interaction between man and machine, which is very much in daily life, needs to be utilized in the field of education as well. According to Gustafson (2002), mobile VR will reshape learning of people of all ages. The abilities in solving problems at top-level can be attained through these technologies (Rieber, 1996).

It has been suggested that by immersing students in authentic learning environments, VR aids to enhance the knowledge that is attained through instruction. In spite of this, majority of investment is in science fiction, industry, entertainment and games instead of education. Yet, VR was used in education for a period of time

in the fields that need practice to learn, for example, flying and surgical training (Strangman & Hall, 2003). Additionally, despite of the almost limitless possibilities of virtual technologies, a limited number of studies have been carried out on the effects of VR tools on learning. The limitations of this field of research make it difficult to get these tools into the teaching curriculum and widespread use in language teaching. For this reason, it is important to conduct more studies to present experimental data by researchers. The conclusions of this research will lead to have an idea about the potential of VR tools supported learning setting and provide experiential data to educators about the usefulness of VR tools on vocabulary gain and retention, as well as learners' opinions about this new technology.

Even supposing VR has great potential in education, its expensive components led to less use of it in educational settings due to the financial concerns. This generally paved the way to more non-immersive virtual reality use as a supporting tool in education (Lee, et al., 2009a; McArdle, et al., 2004; McLellan, 2004; Yang & Heh, 2007). However, VR and its components have been more affordable both in terms of price and availability on the market today. This increased the interest in VR in every field of education. Second language (L2) teaching is one of them. Virtual environments (VE) offer many advantages for learning and teaching L2. All these will be discussed broadly in the following chapters. Having said that, the current study will yield results in respect to the effectiveness of virtual reality on vocabulary learning and retention and learner motivation. The results may guide teachers and education planners for course planning, administrators for budget planning to buy hardware and software, course book publishers to attempt for including virtual reality applications in their materials and ultimately, technology designers for software development. It is also expected that the outcomes of this study could lead to the familiarization of the aspects of immersive VR tools that were used, provide more data on this field and increase interest in VR use for educational settings, especially for L2 learning. In this way, it is expected software developers work on it to improve and create applications which are compatible with language learning objectives as well.

### 1.5. Assumptions

1. In this study, an experiment group and a control group consisting of 20-65-year-old language learners, whose levels are supposed to be close to each other, were accepted as the sample.

2. It is assumed that the students participating in the study were sincerely involved in the work that was done and the questionnaire that was applied.

3. The model and the data collection tools used in the research were suitable to the research problems.

4. It was assumed that there would be no internet outage to be able to use the applications without interruption.

5. The selected virtual reality applications were assumed to be compatible with both Android and iOS operating systems of smartphones.

6. The information provided from the sources was appropriately cited as a reference for the purpose of the study.

### 1.6. Limitations

1. The research is limited to 2018 academic term.
2. This study is limited to a 9-week period of instruction.
3. The participants of the study are limited to 20-65-year old language learners in a language course who are willing to improve their English for several reasons.
4. The number of the participants is limited to 54 (31 participants in experimental group and 23 participants in the control group).
5. The study is carried out with the VR applications that are compatible with the Android and IOS operating systems of students' smartphones.
6. The VR applications are limited to the ones that students can download for free from their smartphone's store.
7. The study is limited to the use of Google Cardboard glasses.

### 1.7. List of Abbreviations

VR: Virtual reality

2D: Two-dimensional

3D: Three-dimensional

OHMD: Optical head mounted display

HMD: Head mounted display

VE: Virtual environment

L2: Second language

L1: First language

IMMQ: Instructional materials motivation questionnaire

# PART II: LITERATURE REVIEW

## 2.1. Introduction

The aim of this chapter is to set the background for the purposes of this study. This study aims to find out the efficacy of VR tools on vocabulary gain and retention and what the learners' opinions are toward VR tools. It starts with definition of virtual reality, its functions, components, history, advantages and disadvantages, then it continues with its use in education and in second language learning. After that, the review of literature on vocabulary learning and teaching will be discussed extensively.

## 2.2. Virtual Reality (VR)

There is no general definition of the concept VR. The researchers define VR according to interaction methods, VR systems they design and the devices they use. The term VR was first used by Yaakov Garb and defined as ability to symbolize the world with images (Garb, 1987). This definition was far from today's computer technology. Sherman and Craig (2003) developed the explanation of VR when they outlined it as "a medium composed of interactive computer simulation that senses the participant's position and actions and replaces or augments the feedback to one or more senses, giving the feeling of being mentally immersed or present in the simulation (a virtual world)" (p. 13). In other perspectives, VR vary from simple environments presented on a desktop computer to fully immersive multisensory environments experienced through complex headset and electronic suits. VR is seen as a system of imitating or reproducing a setting that provides the user with a sense of presence, regulating, and building up a network individually with that setting with his/her real presence (Arts and Humanities Data Service, 2002; Ausburn & Ausburn, 2003a; Beier, 2004; Brown, 2001; Negroponte, 1995; Slater & Usoh, 1993). Lately, the Encyclopædia Britannica (2015) describes VR as "the use of computer modelling and simulation that enables a person to interact with an artificial three-dimensional (3D) visual or other sensory environment." The core of VR is the 3D environments created in a computer (Arts and Humanities Data Service, 2002). The environment created through virtual reality is referred to as a virtual world. A simulated physical world that is formed using digital expertise and

sighted two-dimensionally (2D) is seen as a virtual world. Digital entities and human avatars are included at present time in the 3D environment (Britain, 1999).

Three types of immersive VR have been introduced to the users. One of them is *partial or semi-immersive VR*, that is a structure that provides its operators with a sense of presence with slight immersion by a virtual environment (VE), yet it is not immersive enough to ensure the users to forget the actual world around. (Allen et al., 2002; Fällman, 2000), for example, an image on a table can be used where specific head mounted displays (HMDs) need to be utilized to bring the vision of the 3D object on a table-top. *Fully immersive VR* is a virtual setting in which users are totally remote from the physical environment around and a system that needs special hardware (Fällman, 2000), for example, CAVE, the system that the view of the virtual world is reflected on the walls of a room according to the user's head movements. *Augmented reality or mixed reality* is a system in which VR and physical actual world is integrated with combination of computer illustrations into physical world view of the user (Allen et al., 2002; Pan et al., 2006), A user, for instance, can analyze a simulated model animal using a HDM and a genuine surgical knife.

VR and its wearable technology, especially Optical Head Mounted Display (OHMD) devices (See images 2-2, 2-3, 2-4, 2-5, 2-6) have opened new doors for every individual (Pedersen, 2014). These devices appeared in different shapes and sizes such as Google Glass which is light and Oculus Rift, which is large. They are technically given different names in various research, such as wearable eye-display (Pedersen, 2014; Pedersen, & Trueman, 2013; Thomas, 2012), project glass (Chi, et al., 2013; Pedersen, & Trueman, 2013; Roggen, 2014; Starner, 2013), wearable see-through head-up display (Furlan, 2013; Ha, et al., 2014; Starner, 2013), optical head-mounted display (Optical head-mounted display: 2013).

### 2.3. The History of VR

VR was first used in the 1960s with HMD that delivered immersive involvements with simulated images in digital world**.** The leading creations in architecture were done in 1986 (Brooks, 1987, January). The feeling of being there and feeling the space in an artificially created building with VR computer graphics inspired great excitement. That was a sensation which cannot be felt even in real pictures or

animations (Mazuryk, & Gervautz, 1996). When the big advances in VR occurred at NASA, HMD machinery was not obtainable for people. After two decades, it appeared on the market and became accessible in 1989. (Beier, 2004; Negroponte, 1995). In early 1990, the notion of VR spread to the industry of game (Rheingold, 1991; Mazuryk & Gervautz, 1996) but the price and impracticable feature of VR googles and data gloves prevented its acceptation in the 1990's (Virtual Reality, n.d.). The development of the Internet and VR accessibility and capability pointed out the necessity to think on the outlook of VR from mechanical and social points (Mazuryk & Gervautz, 1996). In today's world, communicatıon technologies are increasingly important in social, industrial and educational institutions (Friedman, 2005; Molnar, 1990; Pink, 2006).

Today, VR is distinguished as a mean like telephones and televisions. It comprises of hardware and software. The hardware components of VR comprise of PCs or mobile phones, HMDs (head mounted goggles), and tracking sensors, such as wired vestments. The hardware can give a perfect feeling of immersion (Steuer, 1992).

When it is compared to its old versions, the most significant difference of today's VR is that it is compatible with any smart phone. With the appearance of head mounted display Google Cardboard (See image 2-2), all people had the opportunity to experience VR with their mobile phones in their pockets. Google Cardboard has two optical lenses for the eyes to provide users the recognition in deepness in VR applications. In this respect, VR is at the stage where anyone who is with a smart phone and Google Cardboard, is able to take pleasure of experience in VR applications in a safe environment (Hashemipour et al., 2011; Merchant et al., 2014).

Towards the end of 2016 there appeared entirely a new platform that surpasses the world of VR with its technology, which is called *Project Sansar* (See image 2-1.) It was created by Linden Lab which was the creator of the platform *Second Life* (Pungburn, 2016, April). Sansar is essentially very different from Second Life in its approach. In the Second Life model there is a continual virtual world that occurred in one massive virtual space. However, Sansar claims to be a platform or an app store rather than a mere virtual world (Lang, 2017). Unlike the older platforms, Sansar is optimized for VR head-mounted displays like the HTC Vive (See image 2-3) and Oculus Rift (See image 2-4) but also accessible via PCs and finally mobile devices as

well. It enables its users to create and share their own interactive social experiences with higher standard visual adherence. Avatars in this platform are more expressive than Linden Lab avatars that can more closely mimic human interaction in the platform's social virtual environments. (Pungburn, 2016, April). With the creation of new facial detection of software, Sansar gives its users the feeling of immersion in depth. The users are also the creators of anything in Sansar and they are allowed to construct anything that they imagine with the Linden Lab engine and ever expanding Sansar store. (D'Anastasio, 2017).

Image 2-1: Sansar [1]

### 2.4. Functions of VR

The effect and abilities of VR were relied on to be formed by three characteristics that are immersion, interaction and the capability to occupy and encourage learners (Winn, et al., 1997). According to Rosemblum and Cross (1997), VR systems have three requirements: immersion, interaction and visual realism. These are the factors that make VE be perceived as real. For Burdea and Coiffet (2003), VR comprises of immersion, interaction and imagination. When educators plan a VR course, they do not have to implement all these three features in the learning environments; emphasis may change on one over the other. In this case, it is necessary to make some changes in design and instructional designers and educators should be

aware that how these shifts may affect the choice of selecting VR learning environment (Dickey, 2005b).

### 2.4.1. Immersion in VR

In a very simple way, Astheimer et al. (1994) describe immersion as the feeling of a VR user, that his virtual environment is real. This perception is established by the devices of VR technologies, such as data gloves, HDM, sound or other sensorial stimuli, head-tracker, 3D mouse, wand, or fully instrumented body suit (Wu, Liu, Wang, & Zhao, 2015). The notion of immersion was described by Jennett et al. (2008) as the full participation, which creates the unawareness of time and the physical environment. A perfect immersion in a virtual world can be provided when all our five senses involve. However, most VR environments today only focus on vision and auditory perception. According to Classen, sight is the most crucial sense that collaborating with reason (1997). Sherman and Craig (2003) classify immersion as mental immersion or physical (sensory) immersion and state that these two immersion types create an excellent personal experience in VR. Physical immersion occurs when the visual, auditory and haptic devices change with the movement of the user. Getting the message of visual, auditory, and haptic cues, users gather information to navigate and control objects in the environment to achieve physical immersion. On the other hand, mental immersion means “state of being deeply engaged” within a VR environment (Sherman & Craig, 2003, p.7). Immersive power of VR appears as a great advantage for education that can make learners engage in learning activities (Hanson & Shelton, 2008).

To ensure the highest level of immersion there is a need for a space that is large enough to walk safely and comfortably. This space is defined by HTC Vive VR systems as 1.5 m by 2m. in minimum. However, the suggested maximum area is 3m by 3m. If the VR playing area is limited there is a need to go as small as your area space allows (O'Donnell, 2018).

### 2.4.2. Interaction in VR

Interaction is a recognized action as certain items affect each other. It is appreciated with the help of the 3D regulator devices to handle the computer-generated

environment. The input devices, such as gloves and head-trackers provide the interaction in VE (Mazuryk & Gervatuz, 1996). According to Ggutiérrez, et al. (2008), the perception of being in an environment as a believable place occurs with enough interaction to overcome the tasks efficiently and comfortably. With the real time interactivity feature of VR, a user's input (i.e., gesture) can be detected and responded immediately. These interchangeable actions create a sensation of immersion. Furthermore, users can control the graphic objects that they see on the screen and touch and feel with all their sensory channels, such as visual, auditory, haptic, tactile, smell and taste (Burdea, 1999). The interaction with VR decreases the comprehension load and help users to conceptualize abstract and difficult things (Wetzel, et al 1994).

### 2.4.3. Visual realism in VR

With the use of computer graphics tools, a reality is represented accurately in the virtual world and real-time in a virtual environment creates the feeling of reality through interactions with the users and feedback given to these interactions which are simultaneous to the real world (Ko & Cheng, 2009). Therefore, VR has the potential to create imagination, problem solving ability and engage in meaningful learning (Jonassen, 2000). So, VR can help learners to understand difficult abstract concepts in visual realism (Burdea & Coiffet, 2003).

## 2.5. Components of VR

The hardware and software are the main components of VR systems that allow to recognize computer-generated artificial worlds. (Brooks, 1999; Burdea & Coiffet, 2003; Magnenat Thalmann & Thalmann, 1999; Riva, 2006). The main constituents of the hardware are the VR engine or computer system, input devices and output devices (Bamodu & Ye, 2013b). In the network of VR, input devices provide interaction, output devices provide the feeling of immersion and software provides proper control and synchronization of the entire environment. The process of human-computer-human interaction loop which is fundamental to every immersive system is carried out with input and out devices. Basically, the user is equipped with a HMD, tracker and optionally a manipulation device (e.g., three-dimensional mouse, data glove etc.). As the human performs actions like walking, head rotating (i.e. changing the point of

view), data describing his/her behavior is fed to the computer from the input devices. The computer processes the information in real-time and generates appropriate feedback that is passed back to the user by means of output displays (Mazuryk & Gervautz, 1996 p.14).

### 2.5.1. The Input Devices

The input devices are the instruments that enable the users interact with the virtual world. The movements of the user are captured by input devices and sent to the system as signals. Then the system respond back to the user by means of the output devices in real time. (Dani & Gadh, 1998). In other words, input devices notify the location and the actions that are carried out by the users in the simulated world in real time. The users are allowed to give electrical signals to computer and these signals are perceived as certain commands in VR. Input devices includes gloves, trackers, keyboards, and mouse (2D or 3D) (Mazuryk & Gervautz, 1996). Dani and Gadh (1998) categorized input devices as tracking device, point input device (e.g., 6DOF mouse and force or space ball), bio-controllers and voice device.

### 2.5.2 The Output Devices

The output devices get response from the VR engine and transmit it on to the users through the appropriate output devices to arouse the feelings of its users. The output devices are classified according to senses: graphics (visual), audio (aural), haptic (contact or force), smell and taste. The first three are generally employed in VR systems, however, smell and taste are still not familiar in VR experience. (Bamodu & Ye, 2013b). The feeling of being immersed in the virtual environment is created by the visual, haptic and aural output devices. A kind of helmet, 3D glasses or OHMD which covers users' eyes help users immerse in the virtual world. Wearable vision systems continued to develop and became more ergonomic in the 2000s. The most famous of these is the system Oculus Rift which offers a smooth cybernetic representation of simulated images at an affordable cost (Basu, & Johnsen, 2014) (See image 2-4). Other wearable technologies are Google Glass, (See image 2-6) Samsung Galaxy Gear (See image 2-5), and smart watches (Imagining the Classroom of 2016, 2014). In addition to these technologies there are simpler and cheaper versions, such as Google Cardboard

(See image 2-2) Furthermore, smart phones, tablets, and laptops enable to use these systems with mobility.

Image 2-2: Google Carboard [2]


Image 2-3: HTC Vive [3]


Image 2-4: Oculus Rift [4]

Image 2-5: Samsung Galaxy VR [5]


Image 2-6: Google glass [6]

### 2.5.3. Software

Software is a fundamental part of the VR system. It is crucial in regulating of input and output devices by processing the entering data and producing appropriate response. Distinct from traditional systems VR devices are more sophisticated than those utilized at the computer. VR devices need to be managed accurately and require a huge amount of data access to the system. Furthermore, the most important issue is timing. During this application there is a need to manage all the data in time so as not to cause delay in response. The system must send responds to the output displays immediately in order to provide fully immersion in VR experience (Mazuryk, & Gervautz, 1996). Software is for giving users the feeling of immersion through the simulations in virtual environments. The electronic representations of real environment are lived through with head mounted goggles and wired vestments to ensure real like settings for its users (Steuer, 1992). VR settings can be simulated according to a particular needs of learners or a course program of a language classroom. (Singhal & Zyda, 1999).

## 2.6. VR Applications

Due to its specific features VR encompasses in many fields with extensive applications including architecture, arts, business, design and planning, education and training, entertainment, manufacturing, medical and scientific visualization. (Bamodu & Ye, 2013a).

VR applications have been ubiquitous in today's community. In education, these applications are generally used in science, mathematics subjects and arts and humanities (Burdea & Coiffet, 2003; Dalgarno et al., 2002; Roussou, 2004). There are two kinds of virtual world in use for educational purposes: (1) a virtual world that imitates the real world scenario, for example a virtual museum that is constructed to the history instruction or (2) computer-generated model with 3-D geometric items in a collaborative multimedia setting, for instance bringing about a vase plan from a 2D illustration (Lee & Wong, 2008). These replications can be in different formats, like from computer adaptations of 3-D geometric shapes to greatly interactive, high-tech workroom experiments (Strangman & Hall, 2003).

Many research puts forward that VR simulations can enhance learning in both non-immersive and immersive virtual environments. For example, in n*on-immersive VR applications* learners can study geometric objects two dimensionally via World Wide Web. 2D items or pictures from schoolbooks can be modelled and implemented in 3D with the Virtual Reality Modeling (VRML) design. With the help of VRML browser, learners can reach special figures and explore them from various angles. This gives the feeling of the real objects and the research results show that it affects learning positively (Song & Lee, 2000). Salzman and Loftin, (1996) tested immersive virtual environments for science instruction that have immersive 3D demonstration, numerous viewpoints and aspects, and many sensory hints. With these features *Immersive VR applications* which were used in the science instruction were observed to have potential to improve student learning and capability to build complex and abstract knowledge in their minds correctly. For instance, in an application to study Newton's laws of motion, the learners could become a ball that was moving along a pathway. Multisensory cues helped to attract users' notice to significant variables such as mass and energy.

In a different study another immersive VR application was used to teach gorillas' lifestyle. Students acted out a gorilla and experienced the reactions of that animal to various stimuli and incidents. With the help of the application, the students learned about the concepts of gorillas' reactions and interaction by experiencing in VR which they would not be able to learn by visiting a zoo. The positive attitudes of the students revealed that VR can be exploited in general education to teach secondary school students (Allison & Hodges, 2000).

In their research Liu, et al. (2007) constructed a mixed reality developing structures in classes to learn about the Sun and the planets. In this method, learners viewed the Sun and the planets with a head mounted device sitting around a table. Virtual environment was mixed with the physical world by using cups for interactions between the users and the virtual objects. The cup was used to get fragment of the earth vision and to look at the deep structure of it. This study showed that the use mixed reality is useful for learning and has social impacts on students.

Although many positive effects of VR exist on learning outcomes, they should not be generalized to any instructional syllabus. (Sanchez et al., 2000). In a research, not substantial results were found between the scores of non-visual aid critical questions in the class that was using networked VRML material and the traditional classroom instruction in terms of supporting the effectiveness of this technology (Song & Lee, 2002). It means that when there is no need for visual aids to teach geometry, VR has no effect on learning. In another study Crosier et al. (2000), found no significant advantage of VR over the classes in which conventional teaching methods were used that is using video and board and the classes which were done in VR laboratory to teach radioactivity to middle school students. Both the test scores and attitude rating revealed that no clear gains between the VR and traditional class were available.

### 2.7. Disadvantages of VR

Despite VR has benefits as an educational tool, some studies have also indicated its drawbacks. One of them is that it needs great expertise in programming ability and graphic knowledge, money investment in hardware and software to improve immersive VR, and motivation to use it efficiently in teaching and learning. It is admitted that the

recent technology in VR has considerably decreased the need of talent and outlays, yet it necessitates some amount of money and time. (Mantovani, et al., 2003; Riva, 2003).

Furthermore, as Quinn, et al., (2003) pointed out, there is not much research on the effectiveness of VR when it is compared to the traditional teaching methods. According to these researchers, the obtained results in an evaluation of VR and traditional teaching revealed that most of the students were not good at learning targeted items when were only taught with VR; and it was inferred that VR did not have great potential to be used as the merely teaching means. Only a small number of research have appeared to claim that VR has surpassed the conventional teaching and can be used with great success as the only method in classrooms (Jeffries, et al., 2003; Wong, et al., 2000).

The survey which was carried out between 2013-2014 on the collected works about the pros and cons of the immersive VR in teaching settings by Freina and Ott (2015, January) reports that immersive VR use has been appreciated mostly by adults and the educators who teach adults in specific fields, for example vocational training or university education. The usage of VR is limited with younger children as their hand-eye coordination does not grow enough to use it safely.

Another limitation of VR environments is due to the nature of the equipment they require. Some worries about health and security of the users in immersive VR has come along (Mantovani, et al., 2003; Riva, 2003). For the effective usage of VR, the OHMD devices should be assessed in terms of their appropriateness depending on the educational level, the mental and physical benefits and risks for students and the usability in learning with OHMD (Du & Arya, 2015).

When OHMDs and similar technologies first appeared, the discrepancy between the actions of the users and the sight in the scene caused people to have negative attitude toward VR tools. However, with the advancement in technology this problem has been solved substantially (Freina & Ott, 2015, January).

All in all, the relevant applications and systems are in the early stages (Furlan, 2013) and most of them are mainly concerned with health care, medical, and navigation. As these products have not been used widely on the market yet, there are only very few

studies available to search for the usage of wearable see-through displays, particularly in education (Du & Arya, 2015).

### 2.8. Using VR for Educational Purposes

VR offers distinct advantages when it is used in education. First of all, utilizing VR in today's current education enables educational outreach and help to contact more students. (Bell & Fogler, 2004). VR has a potential to provide learners with motivation as well as practice in learning (Shim, et al., 2003; Bricken., 1991). The most attractive feature of VR is that it enables learners learn in a risk free environment. It is important in some occasions where a risky experiments need to be carried out in a conventional instructional setting. In technical education, VR gives an exceptional sensation that will aid learners convince to learn more on the subject. In chemical engineering VR was employed to form and grow virtual chemical plants to learn about the technology and how efficient it is. The chief objective of the project was to create virtual lab accidents to illustrate students the results of not following the safety procedure (Bell & Fogler, 2004). Especially, in medical education VR is very beneficial as to make sure the safety of a real patient (Huang, et al., 2013; Shim, et al., 2003). Using VR technology in surgical training can prevent the surgeons from doing wrong on operating on a real patient (Ota et al., 1995). To provide useful knowledge and enhance students' capability, labs in engineering education are created to clarify problems individually. Learners can practice their existing knowledge in in a real industrial problem through VR technology. For example, learners can create their model cars in 3D to decrease the cost of trying it in reality with real materials reducing any wastes and hazardous false move (Abulrub, et al., 2011).

VR is widely used in adult training and its use with young children is very limited. Because their hand-eye coordination is under development and use of VR can inhibit their cognitive and physical development its use is restricted with young learners. As health and safety warnings, the HMD technology, Oculus Rift recommends not to use the device with the children under 13. Starting from middle school, VR is seen advantageous aiding the students to explore, comprehend and commit to memory better. The use of VR and its components for a long period of time should be restricted and it is advised to be used with the guidance of a teacher (Standen et al., 2005).

A literature review that was carried out by Freina (et al., 2015) about exploiting immersive VR and HMD in teaching reveals that immersive VR is supportive for learning, offers a training in a safe environment, gives first-hand experience and it increases the student's motivation and engagement. VR, can be generally used in the fields of education and training because it provides its users with real life experiences that is not easy or possible to be accessed physically due to various reasons, such as time problems to experience historical periods (Roussou, 2004), physical inaccessibility, e.g. moving around planets to study the solar system (Detlefsen, 2014), concerns about safety, for instance while training fire fighters avoiding students from dangerous firefighting situations (Williams et al., 2015) and ethical concerns, e.g., in training of a novice surgeon operating on a patient. (Liu, 2014). Furthermore, VR offers a new approach to study and remember new knowledge for all those who prefer a visual, auditory or kinesthetic learning style (Leite et al., 2010). VR based learning also provide learners with multimodal feedback, such as visual, auditory, and haptic (Durlach & Mavor, 1995).

There is an agreement among the researchers on the effectiveness and motivation of VR that provides a distinctive experience for learners if the VR is generated and utilized appropriately (Mantovani, Gaggiolo, Castelnuova, & Riva, 2003; Winn, et al., 1997). Watson (2000) claimed that "Most would consider that . . . such systems provide strong potential . . . for the educational process" (p. 231). By the same token, Selwood, et al. (2000) asserted that studies on VR claims that it can be a strong instructional mean as it can develop students in socially, emotionally and academically. The environment created through VR can address various preferences in learning, make learners work collectively and give the advantage of re-use of materials and sharing them with others (Britain, 1999).

VR has potential to bring constructivist acquisition of knowledge into instruction because it creates an extremely interactive environment in which students learn actively in a simulated setting in a virtual environment (Kim et al., 2001). According to the constructivist theory, learners construct new knowledge by taking part in learning actively through practice on realistic tasks. In other words, they learn experimentally and experientially (Dewey, 1916). Therefore, educators should create real world environments to present meaningful and authentic knowledge in learning

(Jonassen, 1994). In this respect, VR can create real-like environment and enable learners interact with a simulated environment in real time and help them construct knowledge through interaction with objects and events in this artificial world. (Pratt, et al., 1995).

Mobility is important to be able to use the technology in classrooms or other instructional settings. In the perspective of mobility, VR tools provide easy access when it is compared to the former impractical VR accessories. The new technology in VR offers a tool such as goggles, well-matched with mobile phones (Pierce, 2015) which provides users with untethered immersive 360 panoramic views, and applications that can be reached from the Oculus VR app stores. In recent days, getting more affordable and accessible VR has been possible with the advancement in the mobile phones and devices that are integrated with VR technology (Estes, et al., 2016). Currently, there are many mobile HDMs on the market. For example, Google Cardboard, which is simple and cheap and works with an Android or IOS devices. It uses the stereoscopic display and the head tracking of the device. Another example is Samsung Gear VR that is a wireless HDM developed by Oculus VR for Samsung and their phones, Galaxy Note 4 and Galaxy S6 devices. Samsung Gear VR gives higher immersive quality than Google CardBoard (Hussein, & Nätterdal, 2015).

In the next few years, it is likely to see that OHMD devices accompany people, just like smart phones. However, it is a less-explored application and the researchers believe that it is important to investigate the usability and effectiveness of using OHMD for classroom learning. (Du & Arya, 2015). Despite the traditional face to face education is still dominant in education field, new emerging technologies such as VR attract interest in the domain of education. They are conceived as tools that facilitate learning activities in various situations (Ahmed & Parsons, 2013; Bronack, 2009; Chen, & Huang, 2012; Tao & Zhang, 2013; Vallurupalli, 2013).

Yet, every new technology brings its troubles with. It has not been easy to use VR in education in respect to some concerns, such as difficulties in practice, affordability, usability and unfamiliarity in technology (Bricken, 1991). Another important factor that needs to be investigated is learners' opinions about this technology and their enthusiasm to use it in their learning experiences (Huang, et al., 2013).

## 2.9. The Role of VR in Second Language Education

VR applications have offered a new opportunity to the field of education, making the abstract knowledge easy to learn and teach. As well as it is effective on understanding scientific concepts, it has an impact on long-term memory retention. Such immersive environments are helpful in language learning where memory retention and involvement of the learners are the key factors for achievement (Lee, J. 1999). Unlike traditional language teaching textbooks, VR for language learning provides a first-person form of experiential learning giving the opportunity to directly experience for themselves the thing they want to learn. The textbooks that are based on third-person's knowledge are not so meaningful for the learners (Chee, 2001). The qualitative outcomes of third-person versus first-person learning shows that third-person learning outcomes are usually shallow and retention rates are low (Singhal & Zyda, 1999; Chee, 2001). The virtual environments are constructed in a way that provides learners with immediate feedback. The immediate feedback in the language learning encourages cognitive language learning and increases motivation and interaction in the language classroom (Fox, et al., 1994).

The formal teaching of vocabulary has its limitations; the exposure to the target language input is often restricted to the classroom context (Rivers, 1981). VR can provide a common frame of reference and shared applications. This has been discussed in terms of discourse management and vocabulary acquisition in L2 acquisition: "the here and now orientation [of topics] allows learners to make use of the immediate context to interpret the meaning of utterances" (Ellis, 1995, p. 259). Teachers of L2 can create a setting which is responsive to the needs of learners. In this way it is possible to offer students a learning environment in which they are in the center and build their knowledge by themselves. Hence, changing the inactive position of learners in traditional classrooms, VR offers active and experiential learning environments for its users. VR programs can provide second language learners with practice of knowledge in various settings and realistic situations (Chee, 2001).

## 2.10. Vocabulary Teaching and Learning

Vocabulary teaching and learning in L2 was ignored in the pedagogy until mid-1980s (Richards & Renandya, 2002). In fact, the vocabulary may be the most crucial language component for learners (Gass & Selinker, 2008). For this reason, from the mid-1980s and onwards vocabulary for learning a language has gained importance from the researchers (Laufer, 1990; Carter, 1988; Nation, 1990; Willis, 1990; Descamps, 1992; Nattinger & DeCarrico, 1992; Lewis, 1993; Read, 2000). Laufer (1997) states that vocabulary learning is a significant part of language learning and use. Researchers view vocabulary as a vital component of an effective communication (Oxford & Scarella, 1994). Vocabulary or, in a broader term, lexis has the communicative power. It is possible to convey a message by using lexis alone without a good knowledge of grammar (Scrivener, 2005). Widdowson (1978) asserted that native speakers can better understand the utterances with ungrammatical sentences with accurate vocabulary but it is not easy for them to get the meaning of utterances with accurate grammar but inaccurate vocabulary. The vocabulary mistakes that were documented show that L2 learners do lexical errors to a large extent (Gass & Selinker, 2008) and native speakers claim that these errors in lexis make the meaning difficult to understand when it is compared to structural errors in a sentence. Comprehension is definitely of great importance to L2 acquisition; and comprehension of the input depends to a large extent on lexical skills (Johansson, 1978, as cited in Meara, 1984, p. 229).

## 2.11. Categories of Vocabulary Knowledge

The preferences and attitudes of learners of language in learning should be identified clearly. Learners have different levels of vocabulary knowledge. Dale and O'Rourke (1986) presents word knowledge in four levels: (1) I never saw it before, (2) I've heard of it, but I don't know what it means, (3) I recognize it in context; it has something to do with… (4) I know it. Stahl (1985, 1986) defined word knowledge in three levels: association, comprehension and generation. At the *association level* the students can make associations even though they may not get the meaning of the word. At the *comprehension level* they can understand the frequently accepted meaning of the word. At the *generation level* students can use the target word in a different context. In order to be assumed to have complete knowledge of a word, learners should know *form*,

*meaning* and *use* (Nation 2001) which reflect the *receptive* knowledge. As for *productive* knowledge, it requires more details and includes aspects of pronunciation, spelling, nuances of meaning, and grammatical constraints. Generally, learners' receptive vocabulary knowledge is broader than their productive vocabulary knowledge.

Another categorization can be made between *potential* and *real* vocabulary (Berman, et al., 1968, as cited in Palmberg, 1987, p.20). The words that will be recognized by learners although they have not seen them in L2, such as scientific and technological terms, are referred as potential vocabulary. Real vocabulary includes the words that learners can recognize after exposure (Gass & Selinker, 2008).

According to Laufer & Paribakht, (1998) and Laufer (1998), there are three types of vocabulary knowledge: passive, controlled active, and free active. The frequently used meaning of a word is referred as *passive knowledge*. If a specific word is remembered and produced with the help of a reminder it is called *controlled-active knowledge* and the capability of using the word spontaneously involves *free-active knowledge*. It was known that passive vocabulary knowledge develops very fast, yet active (particularly free active) knowledge development occurs very slowly. In addition, they stated that passive vocabulary was always larger than active vocabulary. The gap between knowledge types was smaller depending on the learning environment in the foreign language setting.

Bialystok and Sharwood Smith (1985) underlined the terms knowledge and control. They described *knowledge* as the language system stored in the mind of an individual, and this system is regulated by *control* mechanism while the user of language is performing this process.

One more distinction is between *breadth* (quantity) and *depth* (quality) of vocabulary knowledge (Nation, 2001; Nassaji, 2004). Many studies (e.g., Koda, 1989; Coady, et al., 1993; Haynes and Baker, 1993; Laufer, 1997a, 1997b; Qian, 1999) show that depth of knowledge is a better indicator of L2 reading comprehension than only breadth of knowledge which indicates the number of words a learner knows. There are different degrees of being familiar with a word and these represent vocabulary knowledge depth. Beside knowing the meaning of a word, depth of knowledge involves

other aspects of language, such as relations of the words in meaning, structural specialties, knowledge of words that go together, etc. (Gass & Selinker, 2008).

### 2.12. Factors Affecting Vocabulary Learning and Acquisition

There is still no consensus on vocabulary learning and acquisition among the experts of relevant fields. Due to the fact that psychologists, linguists and theorists of L2 acquisition have different concerns about vocabulary learning, there is no agreed list of factors and ways which influence vocabulary acquisition (Takač, 2008). Armstrong (1994) examined the use of Gardner's theory in the classroom and ended up the conclusion stating that each person has all eight intelligences that work together in complex ways. Yet, other theorists have dealt with the study of learning styles from the perspective of gender, age, experience and maturity stating that people have different tendencies to learning approaches and learning situations, (Belenky, at al., 1986).

#### 2.12.1. Linguistic Features

Considering the fact that linguists offer so many definitions of the term 'word', this issue seems to be rather complex. (Carter, 1992 p.4) The interpretations about defining a 'word' are limited and incomplete for linguists and second language acquisition theory. To overcome this complexity, the term 'lexical unit' has been introduced. This term embraces orthographic, phonological, grammatical and semantic features of a 'word'. It covers inflections, polysemy, multi-word items such as compounds, phrasal verbs, and idioms (Takač, 2008).

Scrivener (2005, p.227) states that attitudes to vocabulary teaching have changed in the course of time. The concept of 'lexis' was introduced as a change of understanding and approach in this field. While vocabulary generally refers to single words (e.g. book, red) or some closely coupled two or three word combinations (e.g. cd player, dress up), lexis involves arrangements of words and their combinations in mind and uttering them spontaneously and without thinking on the several aspects of language system. Lexis can comprise of single items (e.g. table, run), patterns that go together which are known as 'collocations' (e.g. fast food, make money) and longer combinations of words named as 'chunks' or 'multiword items' which are used together as single items (e.g. someone you know, If I were you). These types of long

combinations are sometimes classified as ‘idioms’ (e.g. a piece of cake, raining cats and dogs) and changing any of the words results in losing its meaning. Collocations and chunks can be considered as between vocabulary and grammar. Teaching combination of single words as a single meaning, in other words teaching lexical items, makes more sense than teaching single vocabulary items. For instance, there is little point in teaching the words ‘feel’ and ‘free’ separately and expect that the learners will explore how to combine these words to get the meaning of ‘feel free’. This should be regarded as a piece of vocabulary to deal with in the class.

### 2.12.2. The Influence of First and Other Languages

Jiang (2000, 2002, 2004) suggests a three-stage model of adult second language vocabulary learning. In the first stage, learners are familiar with structure of a word and realize its meaning as they think together with their L1. In the second stage, with ongoing exposure and use, this process is carried out through the first language (L1) translation. In the third stage, L1 is quitted, but Jiang (2000), asserts that most of the words, continue to stay in the second stage. He verifies these claims with his various empirical studies. However, Lee (2007) opposes Jiang’s theory and adds that the underlying characteristic of meaning exchange depends on the effect of L2 competence, not the impact of L1.

In L2 learning, learners try to construct a new lexical form onto already existing conceptual and semantic systems linked to their L1. In some cases, L1 facilitates the acquisition of lexical items but in others, it may be a handicap (Takač, 2008). The learners are prone to suppose that the system of L2 is nearly the same as in their L1 until they notice that it is not (Ringbom, 1987). In his research Adjemian (1983) determined that L2 learners tended to transfer lexical patterns from their L1 to their L2. In another research, Meara (1978) claimed that learners and native speakers of the language utter dissimilar connotations. The ability to produce native-like word associations depend on the learner’s word knowledge in terms of breadth and depth (Schmitt and Meara, 1997). Word formation, in other words, knowing how to combine elements to produce new items, also varies from one language to another. Word collocation and combination, which are known as the words that often appear together,

may cause learners make mistakes and they need to be learned as multiword units as wholes (Gass & Selinker, 2008).

### 2.12.3. Other Factors

Other factors influence the learning of a lexical item and make the acquisition of vocabulary difficult. According to Laufer (1997), the factors that affect the learnability of lexical items include pronounceability, orthography, length, morphology, including both inflectional and derivational complexity that increase the vocabulary learning load, similarity of lexical forms (e.g. synforms, homonyms), grammar, i.e. part of speech, and semantic features (e.g. abstractness, specificity and register restriction, idiomaticity and multiple meaning).

### 2.12.4. Incidental Vocabulary Learning

Wesche and Paribakht (1999b, p. 176) defines *incidental learning* as what occurs when "learners are focused on comprehending meaning rather than on the explicit goal of learning new words." Gass and Selinker (2008) comment that incidental learning occurs by the effect of something different, for example, reading a text. Rott (1999) searched the effects of differential exposure through reading on learning and retention of vocabulary and came up with the result showing that two encounters with the targeted words were satisfactory to improve vocabulary knowledge and when the learners were exposed to the words six times it was seen that the utmost vocabulary development took place. After the exposures, the amount of recalling for receptive knowledge was larger than productive knowledge.

In their study, Gu and Johnson (1996) searched the tactics of Chinese university students learning English in using vocabulary. The students used techniques such as oral and visual repetition, dictionary use, guessing from the context, and relying on word formation. The least successful group consisted of the learners that used rote learning and pictorial repetition (e.g., writing new words with their translation many times to memorize) strategies. The researchers drew a conclusion that vocabulary growth is achieved through extensive reading as well as by utilizing various strategies. According to Hulstijn, (et al. 1996), when learners exploit external information (e.g., dictionaries or glosses), the formation of a form–meaning relationship is fostered upon repeated

exposure. However, when there is not such exterior data access, learners frequently do not care a word that they do not know (see also Paribakht & Wesche, 1999), or deduce wrong things. Ellis & He (1999) claims that short and long term retention of vocabulary in incidental learning occurs when learners use the lexical items in a communicative context. According to Newton (1995), the sort of task has a specific involvement on the issue of acquisition of words. Gass (1999) asserts that the strong relation between the two languages, several encounters and being familiar with the words have a positive impact on the incidental learning. Otherwise, there is a need for purposeful learning. Hulstijn and Laufer (2001) and Laufer and Hulstijn (2001), link memory retention with the concept of depth of processing. They also offer the notion of *involvement*. According to them, involvement comprises of requisite, quest, and evaluation. The motivation that a learner has is called as *need*. The needs can be both internal and external. Internal needs are stronger than external needs. *Search* means an attempt to learn the meaning of a word and *evaluation* refers to an effort to decide on the contextual correctness of a word.

### 2.12.5. Incremental Vocabulary Learning

L2 lexical item knowledge is characterized by several aspects of word knowledge such as phonological and orthographic, morphological, syntactic and semantic (Takač, 2008). Thus, it is not realistic to believe that learning vocabulary occurs in one go. A first exposure to a word attracts attention and other exposures give students a chance to decide on related meaning and sentence structure knowledge (Gass & Selinker, 2008). Paribakht and Wesche (1993) offered a Vocabulary Knowledge Scale with five stages: (a) the word is unfamiliar, (b) the word is familiar but the meaning is not known, (c) a translation into the L1 can be given, (d) the word can be used appropriately in a sentence, and (e) the word is used accurately both semantically and grammatically. So, lexical item knowledge should be considered as continuum. In the initial degree, which is elementary knowledge, the learners have the visual recognition of a lexical item in a context and they are considered to have receptive knowledge. In the higher degrees, the learners can produce a lexical item that requires more knowledge (Melka, 1997).

### 2.12.6. The Role of Memory

Lexical knowledge is more inclined to attrition than other types of linguistic knowledge (Schmitt, 2000). Learners forget things in both long-term and short-term memory in a similar way. Most of the learned information is immediately forgotten, then the process of forgetting slows down. For this reason, the learning and teaching of vocabulary requires effective plans and preparation (Takač, 2008). In order to help learners to transfer the things they have learned into the long-term memory, Thornbury (2002) presents some principles that is necessary not to forget a lexical item: multiple encounters with a lexical item at certain intervals, retrieval and use of lexical items, cognitive depth, affective depth, personalization, imaging, use of mnemonics and conscious attention.

### 2.12.7. Exposure to the Input

According to L1 vocabulary acquisition research, the input comes from a wide range of contexts and help native speakers to organize their lexical nets (Carter, 1992). This process occurs incidentally, however in L2 setting, where explicit formal instruction is applied, this process is rather complex. It cannot be denied that L2 vocabulary acquisition occurs through exposure to various contexts, but there are factors which affect this process. For instance, in initial stages of vocabulary learning the context may not play a very important role because inferencing from the context has to do with learner's proficiency level (Nagy, 1997).

As they do not have enough lexical knowledge, beginners make deliberate attempts to learn new vocabulary items such as translation into L1, defining, connecting to a synonym, or illustrating. Most of the time, vocabulary items can be learnt through rote learning (Carter, 1992). However, vocabulary learning is not simply learning an L1 equivalence or one to one correspondence of individual lexical item; lexical knowledge includes discovering the new patterns in the language and starting from phonological categories to collocations and lexical phrases, and their analysis into meaningful units or chunks. This means that language production is based on associating ready-made chunks appropriate for certain situations and that language comprehension is based on the competency to predict the pattern that will appear in a specific situation. Therefore, L2 learners should acquire lexical sequences (collocations, phrases and idioms) and

sequences within lexical units. Using of idiomatic, frequent and familiar units shows a native-like competence (Ellis, 1997). The role of context in initial stages is limited, but it becomes significant as leaners' knowledge develop. Reading is the ideal source of vocabulary learning in context. An average learner can be able to recognize up to 1000 words a year from written materials (Nagy, 1997). However, mere exposure to reading does not provide a fast vocabulary growth, but the learners need to have strategic knowledge to learn explicitly (Takač, 2008).

Another issue to be considered while teaching vocabulary is the amount of items to be presented. The number of words to be taught depends on some factors, such as the level of the learners, the learners' probable familiarity with the words, the difficulty of the items, their ease to teach (by explaining and just showing), and whether the words are learned to produce or for recognition only. In addition, the students should not be overloaded with a lot of new words which stress them out, and the presentation stage should not take long, there should be enough time for practice. In course books there is a tendency to present at most a dozen items at a time (Thurnbury, 2002). According to Stahl and Fairbanks (1986), a typical vocabulary program includes 10-12 words a week.

### 2.12.8. Learner Differences

Based on research on learner differences, Skehan (2000), has introduced four categories of individual differences: modality preference, foreign language aptitude, learning style and learning strategies. *Modality preference* implies the preferred input channel - visual, auditory or kinesthetic. *Language aptitude* suggests that the learner can have either language analytic capacity or memory predisposition. *Learning style* refers to cognitive dimensions holistic versus analytic processing as well as to visual versus verbal representations. The learner's personality also accounts for learning style which may be either passive or active. *Learning strategies* are classified as metacognitive, cognitive and socio-affective. Learning strategies are the most flexible of all other learning differences and their development and use are subject to change with instruction.

### 2.12.9. Language Learning Strategies

There exist various definitions of language learning strategies because many researchers defined this concept in the context of their research (Takač, 2008). Oxford (1990) summarizes tactics in learning a language as precise deeds, performances, movements or ways of learning that learners use to develop their competence in L2. They include physical and mental activities and can be both observable and unobservable (Purpura, 1999). The choice of language learning strategies is affected by some factors such as education (Ehrman & Oxford, 1989; Peacock & Ho, 2003), teachers' expectations and learners' proficiency level (Green & Oxford, 1995; Lan & Oxford, 2003), age (Ellis at al., 2000), sex (Dreyer & Oxford, 1996; Ehrman & Oxford, 1989), nationality, learning style, previous experiences (Elbaum et al., 1993), motivation, self-efficacy (Wong, 2005), personal beliefs and attitudes about language learning (Bialystok, 1979).

As it is widely accepted, language learning strategies are categorized as cognitive, metacognitive and social and affective (*inter alia* Cohen, 1998; O'Malley & Chamot, 1996; Williams & Burden, 2001). *Cognitive strategies* are mental steps or actions that are used in learning or problem solving, and they require direct analysis, transformation or synthesis of learning material (Rubin, 1987). They include mental processes concerned with obtaining, storage, retrieval and use of information in order to learn (Williams & Burden, 2001). *Metacognitive strategies* are based on knowledge about learning and includes planning of learning, reflecting on the procedure of acquiring knowledge, setting of goals, observing the performance and apprehension. In other words, learners look at their learning from the 'outside' (Williams & Burden, 2001). Metacognitive strategies play an important role in successful language learning and help learners control their learning process and progress (Oxford, 1990). *Social Strategies* involve cooperation with others, e.g., other learners, the teacher or speakers of the target language and they provide them with an environment where they can practice, however these strategies do not affect learning directly. (Rubin, 1987). *Affective strategies* are initiatives of learners to understand and gain control over their feelings (Bimmel, 1993).

Language learning strategies are important not only for learners but also for teachers and researchers in L2 learning both because they affect success or failure and they can be taught in order to make learners efficient learning strategy users. While teaching how to use the learning strategies, teachers should consider the individual differences (Takač, 2008).

### 2.12.10. Vocabulary Teaching Strategies

Teaching approach or strategies to vocabulary teaching are among the factors which affect vocabulary learning. Teaching strategies are important to ensure the lexical richness, its constant development, and learner motivation. Thus, teachers should consider general teaching strategies, principles of planning and organizing a lesson (Takač, 2008).

Teachers have always been influenced by current trends in theories and approaches in language acquisition. For instance, the Grammar Translation Method did not give priority to teach vocabulary, lexical items were only taught when a word demonstrated a grammatical rule (Kelly, 1969). In the direct and audiolingual methods vocabulary teaching was ignored because a greater priority was given to teaching of grammar. In the Direct Method, concrete vocabulary was defined by showing pictures or pointing at the objects whereas, abstract vocabulary was explained by associating of ideas (Rivers, 1983; Richards & Rodgers, 1986). On the other hand, the choice of vocabulary items to be taught depended upon the easiness and acquaintance of the words and they are taught through drills (Larsen-Freeman, 1986). The Reading Method emphasized the importance of selection and ordering of vocabulary in instruction and learning and using them in meaningful activities (West, 1930). With the communicative approach, the value of vocabulary in communication was recognized and vocabulary teaching gained importance (Thornbury, 2004).

The teachers who adopted naturalistic approach employed implicit incidental vocabulary learning, which emphasizes the importance of guessing the meaning from context and using monolingual dictionaries and avoiding translation. Though, exposure to a variety of contexts was seen as very important in acquisition of vocabulary, its effects indicated that inferencing is not easy all the time. Even if learners have strong inference skills and level of knowledge, they might get incorrect guessing. While

incidental vocabulary learning (inferring the meaning from context, checking it with a dictionary and writing it down) is enough for immediate comprehension and helps memory retention (Huckin & Haynes, 1993; Nation, 1982; Schouten-Van Parreren, 1999), Hulstijn (1997) says that this procedure does not guarantee for the retention of the link between the word's form and its meaning. To sum up, it is thought that implicit incidental learning is slow and does not provide efficient long term retention (Sökmen, 1997). In order to not to forget a word learners should learn it intentionally. If learners have difficulty in learning and remembering a word, they can be advised to use a mnemonic technique, such as keyword method. On the other hand, this way of learning is rarely practiced due to the difficulty of its applicability; because it is not easy to find a mediating word (Kasper, 1993; Oxford & Crookall, 1990). According to Judd (1978), a systematic and controlled explicit teaching needs to be employed from the very beginning of language instruction. Lewis (2000b) defines teaching as linear and systematic, but points out that learning is not the same. The contemporary approach to vocabulary teaching acknowledges the importance of both implicit and explicit teaching for more efficient vocabulary teaching and learning.

A substantial body of research that was carried out with English-language learning students in the United States revealed some successful vocabulary teaching ideas: presenting words in meaningful contexts, such as in interesting texts; encouraging participation and motivating students; teaching vocabulary should be in depth and occur over time with repetition and review; lessons should involve discourse around the text; vocabulary study should build on students' background such as cognate identification; lessons should involve scaffolding such as visual materials, simplified syntax, or oral language practice activities (Helman, 2008). According to Blachowicz (et. al., 2006), there are three characteristics of strong vocabulary teaching: (1) the need for language and word rich environments, (2) the intentional teaching of selected vocabulary; (3) the developing of word learning strategies.

The teaching strategy of a teacher depends on the time available, the content, and its value for learners (Hatch & Brown, 2000). Seal (1991) discriminates between planned and unplanned vocabulary teaching strategies. Unplanned teaching strategies are applied spontaneously with the aim to help learners when an immediate need arises. Seal introduces three-step procedure while teaching vocabulary: convey, check and

consolidate the meaning. Planned vocabulary teaching needs to be clearly defined, explicit and deliberate. According to a review of the literature (Hatch & Brown, 2000; Nation, 2001; Sökmen, 1997; Thornbury, 2002), two major categories of teaching strategies have been identified: (1) presentation of new lexical items and (2) review and consolidation. Presentation of vocabulary needs to be based on various techniques in order to address different learning styles and to break the classroom routine. For review and consolidation, Schmitt (2000) places emphasis on the revision of the material immediately after initial learning and then at gradual intervals, e.g. one day later, a week later, a month later and finally six months later. The teacher should find various ways to provide learners with opportunities for practicing and retrieving words from memory.

To conclude, in L2 vocabulary teaching, the teacher consistently encourages, monitors, corrects, directs, evaluates and tests. Formal vocabulary instruction needs to be based on a variety of teaching techniques with continuous and systematic revision and assessment (Laufer, 1991).

### 2.13. Classroom-Based Language Assessment

Classroom-based language assessment gives results to make decisions about instruction and students and a strategy is needed to use these results effectively. To make a decision, there is a need to identify the purpose of the evaluation, collect information and interpret it (Genesee & Upshur, 1996).

### 2.14. Language Assessment from the Past to Present

In the middle of the twentieth century, behaviorism and structuralism had an impact on language testing highlighting grammatical sentence level, definitions and translation of vocabulary items. According to this approach, assessment of four skills – reading, writing, listening, speaking and other units of language discretely can be done successfully. Then, the new emerging pedagogy which emphasizes more communicative competence opposed the discrete point approach of behaviorism and structuralism which are inauthentic and decontextualized (Abeywickrama & Brown 2010).

On the other hand, in integrative approaches language competence was seen a set of interacting abilities that cannot be tested separately (Oller, 1979). Cziko (1982) offered *integrative testing* which includes cloze tests and dictations that measure overall proficiency and that include knowledge of vocabulary, grammar, discourse structure and reading skills. By the mid-1980s Canale & Swain's (1980) work on communicative competence awoke the idea of communicative language testing. According to this view, language testing should both test language performance and language use in an authentic and natural way (Bachman & Palmer, 1996; Shekan, 1988, 1989; Fulcher, 2000).

Now, more student-centered agenda gain importance by language courses and test designers around the world (Alderson & Banerjee, 2001, 2002; Bachman, 2002; Leung & Lewkowicz, 2006; Weir, 2005). This new approach to testing, which is called *performance-based assessment*, offers oral and written production, open-ended responses, integrated performance across skill areas, group performance and other interactive tasks instead of paper-and-pencil multiple choice test of separate items (Abeywickrama & Brown 2010).

Towards the end of the twentieth century, traditional view of intelligence extended the view of intelligence to eight different parts that are called multiple intelligences: spatial, musical, kinesthetic, naturalistic, interpersonal, intrapersonal (Gardner, 1983, 1999), creative thinking and manipulating strategies (Sternberg, 1988, 1997). However, the multiple intelligences view was not accepted by the academic community (White, 1998). This view of assessment was believed that it had lack of objectivity in measuring such constructs as interpersonal intelligence, creativity and self-esteem (Armstrong, 1994). Despite the recognition of multiple intelligences has had an indirect effect in the language assessment field, diversity of learning abilities and styles have been appreciated by communicative classroom activities in textbooks and programs (Abeywickrama & Brown 2010).

One of the current issues of today involves alternative assessment. Performance-based classroom assessment is a trend to supplement traditional assessment with alternative assessment that is more authentic in providing meaningful communication (Abeywickrama & Brown 2010).

In recent years, *computer-based testing* has gained importance and it can provide small-scale home-grown tests (e.g., tests available on Web sites), and large-scale standardized tests (e.g., TOEFL® Test). Using computer technology creatively, teachers and test makers can increase authenticity, interactivity and autonomy (Abeywickrama & Brown 2010). Computer technology can provide convenience of communicative language teaching and testing (Chapelle & Jamieson, 2008; Jamieson, 2005).

### 2.15. Testing of Vocabulary

Vocabulary knowledge is complex and therefore no single measurement can contain the whole knowledge of vocabulary. In order to measure anything, the units of measurement should be understood and used appropriately. Vocabulary tests are constructed considering two main issues: which words are to be measured and what method is to be used for measurement. Different aspects of word knowledge need to be tested with different methods. Language measurement is not an issue of belief, but it is the issue of collecting and evaluating the information obtained empirically (Milton, 2009).

Abeywickrama and Brown (2010) classifies the assessment instruments according to their purpose. Teachers need to be familiar with the common types of classroom based assessment in order to design their own tests for their own assessment purposes. *Achievement Tests* are widely used by classroom teachers to measure students' ability in a lesson, unit or even a total curriculum and they are restricted to a particular material which exists in a curriculum within a time of frame. *Diagnostic tests* are applied in order to diagnose the aspects of a language that learners need to improve and that a course need to cover. These tests can reveal more detailed information on what students need to work on in the future. *Proficiency tests* assess the overall ability of a learner and they are not limited to specific curriculum or a course. They include standardized multiple choice items grammar, vocabulary, reading and aural comprehension. *Placement tests* aim to place a student into the right level of a language curriculum or a section of a school. A placement test usually includes the material to be covered in a course in a curriculum.

For a long time, vocabulary testing was not standardized in the field and it was not possible to compare the results of one experiment with another in a meaningful way.

Now, even though there is not a testing system which can test every aspects of vocabulary knowledge, there are some well-structured tests that have the capacity for large scale studies and comparisons. For making a good vocabulary test there should be some considerations (Milton, 2009): Does the test measure exactly what it is desired to measure? Is it consistent? Is it compatible with the administrative constraints? Does the language represent the real world language use? Does the test give useful feedback to the learner? These considerations are the five criteria that need to be used to evaluate a test: validity, reliability, practicality, authenticity and washback (Abeywickrama & Brown 2010).

### 2.16. Types of Vocabulary Test

*Multiple choice* test is the most common way of testing vocabulary knowledge. It can be seen with isolated words, words in a sentence context, or words in whole texts. Multiple choice test is easy to score, however writing distractors for the options may be challenging and they only test receptive vocabulary knowledge. An alternative to multiple choice is gap-filling. *Gap-fill* tests test the productive vocabulary knowledge of learners in which they are asked to recall the word from memory to complete the sentence or text. The widely used one is the *cloze test* where the blanks are regularly spaced. Cloze test enables to test a wide range of word types, such as grammar words and content words. The variant of the cloze test is *selective (or open) cloze* where the specifically chosen words are deleted in the text. This type is more valid in terms of testing the content words that are targeted. It is possible to give the initial letters of the words in the selective cloze test to prevent the confusion that would occur when there are more than possible answers. *C-test* is another variety of this approach. In a C-test the second half of every second word is deleted and the learners are asked to complete. Researchers have revealed that C-test provide success as any other types of vocabulary tests, therefore it is valid and can be used as a placement test. However, they are not widely used due to the fact that it is not easy to test targeted items. Another gap-filling test is *word formation* technique where the students are asked to convert the word from one form to a different and appropriate one depending on the text context. That kind of task also requires the ability to understand the context clearly in order to choose the right form. In order to assess a learner's ability to create their own sentences in contexts

that show the meaning of targeted words, they may be given a choice to *create a sentence* or *a whole writing* that covers the given vocabulary items (Thornbury, 2002).

### 2.17. Designing Vocabulary Tests

The first thing in designing tests is to *make clear the purpose of the test* so that the results can be evaluated in relation to the planned use of the test. Next, there is a need to *define the construct* or the ability we intend to measure. Teachers, mainly, rely on syllabus-based approach to define the construct (Abeywickrama & Brown 2010). The syllabus-based approach is suitable for defining the construct because "the lexical items and the vocabulary skills to be assessed can be specified in relation to the learning objectives of the course" (Read, 2000, p. 153). According to Abeywickrama & Brown (2010), the theory-based construct is appropriate for assessing vocabulary proficiency. After defining the construct, we need to *select the target words.* Then, we should *determine mode of performance*. There are two modes of performance: recognition or comprehension and recall and use. In the recognition or comprehension mode, the words are given and students are expected to show they know the meaning of that lexical item. In the recall and use mode, they are provided with a kind of stimulus to elicit the word from the student's memory and they are asked to produce that word. Milton (2009) defines these two modes of performance as receptive vocabulary knowledge and productive vocabulary knowledge. To test receptive vocabulary knowledge, test writers need to choose words that may be presented to the learner who do not need to produce the language at all. A test of productive vocabulary knowledge needs a technique that can elicit vocabulary.

Whether the test includes a context, or it tests productive or receptive knowledge depends on the purpose of the test and its possible effect on teaching. For instance, if the aim of the evaluation is to test reading skill of the learner, then a contextualized receptive test needs to be applied because reading requires a context to use the clues and be able to work out the meaning. Although de-contextualized word tests can provide practicality to construct and score, they may cause learners only to memorize lists of words and obviously it might not valid for testing reading ability of a learner (Thornbury, 2002).

### 2.17.1. Designing Assessment Tasks to Test Receptive Vocabulary

While creating vocabulary assessment tasks, there is a need to create a context to point out a particular meaning of target word. The context is generally created with one sentence in order to provide practicality of construction and scoring. So, *word recognition* is required according to the given context (Abeywickrama & Brown 2010).

Another way to test receptive vocabulary assessment task is *matching exercise*. In this type of task, the learners are asked to match the word with its meaning as in the example below (Read, 2000, p. 172):

Vocabulary knowledge can be tested not only for assessing progress and giving feedback, but also for proficiency purposes. For this purpose, the learner's vocabulary size is tested with *word association* test. In this test, the target word is presented as a stimulus and test takers are asked to find out the word that is closely associated with the target word (Read, 2000).

### 2.17.2. Designing Assessment Tasks to Test Productive Vocabulary

The context, as is the case with receptive vocabulary assessment task, is important in productive vocabulary assessment task as it requires recall and use. *Sentence completion* is a common task that is used to elicit target word from a learner's memory. In order to do produce the target word, the test taker should understand the context clearly. It is possible to assess the form and lexical item along with its meaning with longer passages. This is called *selective-deletion cloze* or *gap fill test* (Abeywickrama & Brown 2010).

# PART III: METHOD

## 3.1. Introduction

This chapter presents information about the research design, the participants, the instruments, the data collection procedures, and the methods used for data analysis.

## 3.2. Research Design

The aim of the study was to find out the effectiveness of VR tools on vocabulary learning and retention. To obtain the results, the study was carried out with two groups that were considered at the same proficiency level, which is A2 elementary English. The experimental and control group were selected randomly. While the experimental group was instructed with VR tools, the control group had conventional teaching without VR tools. The two groups were presented the same topics at the same time limits. The pre-test, post-test quasi-experimental design was employed to establish a cause-effect relationship between the interventions and learning outcomes. To determine the level of retention, a follow-up test was used. Experimental method is used to determine the response of the subjects to the variables and to determine the cause and effect relationships between the variables (Karasar, 2010). This method is the most commonly used experimental method, especially in the field of education, where it is not possible to keep all variables under control (Aydede & Matyar, 2009).

## 3.3. Participants

This study was carried out with two groups in an English course opened by Büyükçekmece Municipality in Istanbul. The experimental group consisted of 31 students (21 females, 10 males) and in the control group there were 23 (16 females, 7 males) students. The groups were formed by the institution before the study began and the students were assigned to groups randomly. The researcher was not able to manipulate the groups. Their level of proficiency was A2 elementary. The age range was 20-65.

### 3.4. Data Collection Instruments

In this study, two kinds of instruments were used to collect data: tests (a pre-test, a post-test, and a follow-up test) and one questionnaire. The material motivation questionnaire consisted of twenty-four questions. The scoring was done depending upon a likert scale ranging from (1) Strongly Disagree to (5) Strongly Agree. The questionnaire was adapted from by Keller (1987) and it was translated into Turkish by Kutu and Sözbilir (2011). (See Appendix 2). The questionnaire aimed to reveal the learners' attitudes towards the VR tools that was used in the study. The pre-test was designed to test the targeted vocabulary knowledge of the students and it included all the items that would be presented during the study (See Appendix 3). The post-test was applied in the end of the instruction and covered all the topics and vocabulary items to test the students' knowledge. (See Appendix 4). The follow-up test was designed to test long term memory retention of the targeted words and applied after four-week interval. (See Appendix 5). The scores obtained from pre-test and post-test were compared to determine the effects of the VR tools on vocabulary learning and the scores obtained from post-test and follow-up test were used to define the effects of the VR tools on vocabulary retention.

### 3.5. Procedure

In order to test the effects of VR tools in teaching vocabulary, quantitative data was gathered. At the very beginning, the targeted vocabulary knowledge of the experimental and control group students was pre-tested. During the study, three different topics of vocabulary were presented to the students. At the end of the instruction, a post-test that covers the three topics and targeted vocabulary items was applied. Then the students returned to their normal classroom activities with their teacher for four weeks. After a four-week interval, a follow-up test was administered to test the retention of the targeted vocabulary. Another instrument that was applied in the end of the study to find out the opinions of the students about the materials was Instructional Materials Motivation Questionnaire.

Having two lessons each week, the study took 9 weeks in total. In the first week, the students were introduced with the study outline and had the pre-test. After six

weeks, the instruction was completed. In the eighth week, all the topics were revised. Finally, in the ninth week, the students did the instructional materials motivation questionnaire (See Appendix 2) and had the post-test. Both pre-test and post-test were similar in content and design. There was multiple choice, gap-fill, and word/sentence writing activities in the tests. The total point of the tests was 100.

In the classes with the control group, conventional classroom learning activities were done using flashcards, PowerPoint slides and whiteboard. With the experimental group, along with flashcards, PowerPoint slides and whiteboard, Google Cardboard, smart phones and web based VR applications were used as an intervention. Both groups had the same amount of learning time. The only difference was in differentiation of activities e.g., while the control group was doing extra flashcard/ PowerPoint activities in pair/group work, the experimental group was experiencing VR tour to do the given tasks.

Three topics that were selected from the course program and related applications were downloaded from the smartphone store, which is either App Store for IOS, or Play Store for Android operating systems. The applications were downloaded for free. (The free download opportunity has been changing any time; after a while the creators of the applications can change the free downloadable option and charge a fee. By the same token, while some smartphones allow free download of the application, some may ask for a fee for the same application.) The students whose smartphones were not compatible with VR application view, were provided with samrtphones by the researcher. The VR glasses that were used in the study was at the same quality with Google Cardboard glasses, however they were not made of carton, but plastic material (See image 3-1).

In this study, the convenience sampling method was used for the group selection. The choice of this sampling strategy was guided by practical reasons (the accessibility of the participants for the researcher). Their age, gender, and social background were not taken into consideration in this study.

Image 3-1: VR Glasses in the current study
A photo of the real object that was used in the study

The first topic for the first two weeks was parts of the house and the furniture, along with prepositions of place to practice the targeted vocabulary. To achieve the teaching objectives, the VR application named *The Apartment View VR* was downloaded (See image 3-2). In this application a human avatar appears with very limited interaction saying only 'Hello.' The users of this application can have a chance to explore the flat and enter the rooms by opening the doors just focusing on it 3 seconds.

First, the students were introduced with the new vocabulary using flashcards. After the presentation stage of the lesson, it was time to experience the VR application, which was the practice stage of the lesson. So, the students were asked to slot their smartphones into their VR glasses and wear it. In the first run, they were asked to explore the flat in detail entering all the rooms to be able to list as many furniture names as they can remember. In the second run, they walked around the flat in order to learn about the positions of the furniture and keep them in their minds to be able to answer the memory questions that were to be given by the teacher. In the production stage of the lesson, the students wore their headset for the third time to work in pairs to describe the rooms using prepositions of place and write sentences taking turns. The students were taught not only with VR but also with traditional instruction using the board, PowerPoint slides and photocopiable materials.

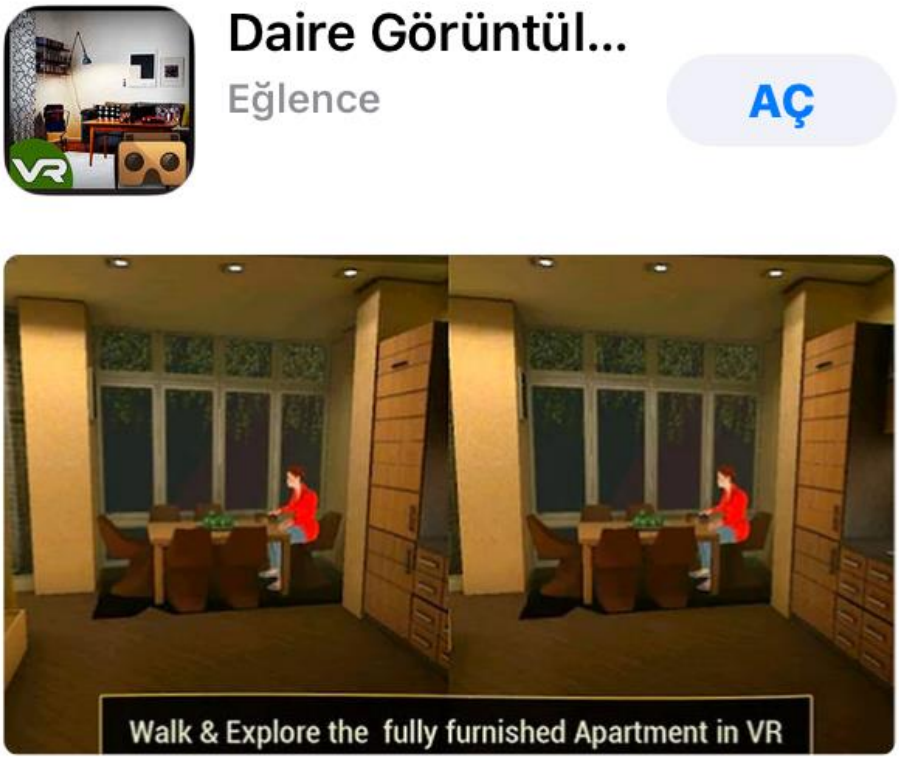



Image 3-2: The Apartment View VR
A screenshot from App store.

The second topic was about food, drinks and containers along with countable and uncountable nouns. In order to teach the targeted vocabulary, the application named *VR Grocery* was chosen (See image 3-3). This application allows users to move the objects by focusing on them. The students were able to put the things they wanted to buy in their trolley just by staring at the object for 3 seconds.

This application was exploited in the practice and production stage of the lesson. After being presented with the new vocabulary using PowerPoint slides, the students wore their VR glasses and started shopping in the supermarket. First, they were asked to buy the food or drinks that the teacher want them to find as quickly as possible. The first person who found and put them in his or her trolley was rewarded. The next time that they experienced the VR was for the purpose of the production of the language; they were asked to write and talk about their shopping. However, the students had some complaints about the VR experience with this application. Majority of the students claimed that it caused severe headache and nausea and for this reason they seemed reluctant to experience again. So, the remaining time was used to do traditional activities.


Image 3-3: VR Grocery
A screenshot from App store

The third topic was animals and animal behaviors. To achieve the lesson objectives, the application named *VR Roller Tour Forest* was chosen (See image 3-4) The first two applications were used in the practice and production stages of the lessons. Different from the that, this new application was exploited in the all stages of the lesson that were presentation, practice and production. The application itself included the animal names with their visuals (See image 3-5). Thus, it was possible to introduce the new vocabulary to the students using this application. In the first time that the students experienced the application, they were asked to work in groups and name as many animals as they can see. When they viewed 360° they were able to see extra animals around which some of them were already known by them. Then, the students were introduced with the vocabulary of animal behaviors with traditional techniques. After that, they were asked to name the animals by their specific behaviors or actions in the application. In the end, they produced the language playing a 'guess what' game. They worked in pairs: while one student was viewing and making sentences about an animal action (e.g. I see an animal that is swimming) in the virtual environment, the other pair guessed the animal (e.g. It's a crocodile).


Image 3-4: VR Roller Tour Forest
A screenshot from App store

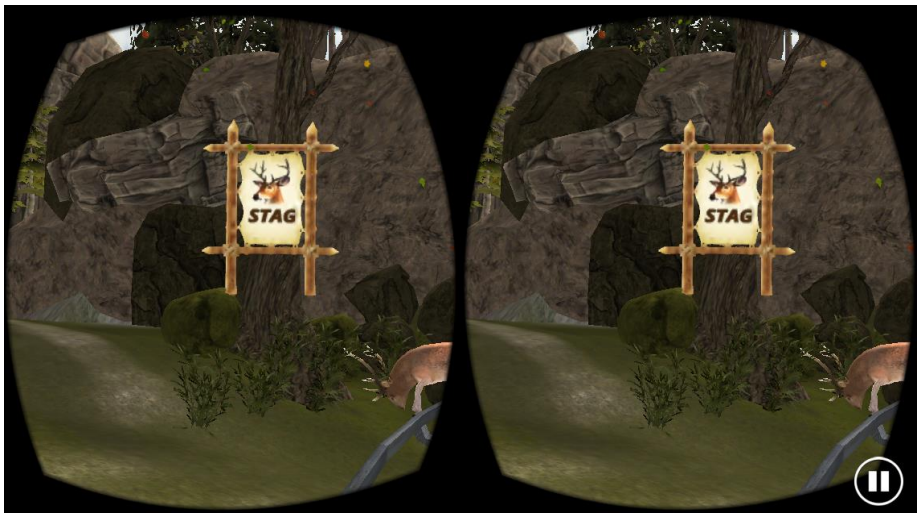



Image 3-5: Display of labelled animals in VR Roller Tour Forest
A screenshot from the application

### 3.6. Data analysis

Pre-test and post-test designs are commonly used in educational research designs to explore effects of treatment on participants. In addition to pre-test and post-test, follow-up test and a material motivation questionnaire was employed in this study. All of the data collected at the end of the study were statistically analyzed by means of

the Statistical Package for the Social Sciences (SPSS) version 20.0. To get an informative analysis, an Analysis of Covariance (ANCOVA) and Independent Samples t-test were utilized to make comparisons and evaluate the effect of the VR tools on the vocabulary learning and retention. In the study, 95% confidence interval, $p = 0.05$ significance level were considered for the analyzes.

The data were analyzed in three phases. In the first phase, pre-test results were analyzed by the Independent Samples t-test to identify whether there was a significant difference between the experimental and the control groups. Then, using the pre-test as the covariate, the post-test results were analyzed by the ANCOVA test to observe any changes in terms of vocabulary learning between the control and experimental groups in their post test scores. After that, follow-up test scores of the groups were analyzed by using the Independent Samples t-test to find out the effects of the treatment on vocabulary retention.

# PART IV: DATA ANALYSIS AND FINDINGS

## 4.1. Introduction

This chapter aims to introduce the results of the data analysis procedures related to each research question. The results obtained from the statistical analysis will be presented via tables and graphs.

## 4.2. The Effectiveness of VR Tools on Vocabulary Learning

As it was reported before, the research design includes an experimental group receiving the treatment of VR tools supported learning and a control group receiving no treatment. The first research question aims to investigate the effects of VR tools on EFL learners' vocabulary learning. In this respect, two sub questions were identified. The first sub question (a) investigates whether there is a significant difference between the control and experimental groups in their pre-test scores. It is critical to conduct a pre-test to evaluate the both groups' initial vocabulary levels preceding the treatment process as it is important for the study that the groups are at the same level.

Thus, to find an answer for the first sub-question (a), a pre-test was conducted to find out and be able to compare both groups' targeted vocabulary knowledge and the outcomes were examined using an Independent Samples T Test. As could be seen from the Table 4-1 and Table 4-2 ($p>0,05$), the results did not indicate a significant difference in the scores between control ($M = 53.87$, $SD = 12.048$) and experimental ($M = 54.2$, $SD = 12.129$) groups; $t(38) = -.511$, $p = 0.40$. For this reason, neither the control group nor the experimental group were superior to each other in the target vocabulary knowledge and could be equally evaluated at the beginning of the study.

**Table 4-1: Group Statistics for Pre-Test Scores**

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pre Test | Control Group | 23 | 53,87 | 12,048 | 2,512 |
| | Experimental Group | 31 | 54,20 | 12,129 | 5,534 |

**Table 4-2: Independent Samples Test Results for Pre-Test Scores**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 95% Confidence Interval of the Difference | |
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Pre test | Equal variances assumed | ,061 | ,439 | -,511 | 40 | ,40 | -,500 | 4,260 | -7,608 | -,702 |
| | Equal variances not assumed | | | -,511 | 38,261 | ,41 | -,500 | 4,260 | -7,608 | -,702 |

As a significant difference was not observed in groups' pre-test scores, the treatment phase of the research was started. The experimental group was instructed with VR tools for six weeks and the control group received traditional classroom instruction for the same period of time.

In order to learn whether there is a noteworthy difference between control and experimental group in their post-test scores as it was stated in the second sub question (b), a posttest was conducted with both control and experimental group to observe any change in participants' vocabulary learning and the results were analyzed through ANCOVA test using the pre-test as covariate. Mean scores and standard deviation of both groups can be seen in Table 4.3. As it is seen, there is an increase in both groups' scores, however, the mean score of the experimental group (77,17) remained almost ten points below the score of the control group (87,57).

**Table 4-3: Descriptive Statistics for Post Test Scores**

Dependent Variable: Post Test

| Group | Mean | Std. Deviation | N |
|---|---|---|---|
| Control Group | 87,57 | 11,475 | 23 |
| Experimental Group | 77,17 | 13,024 | 31 |
| Total | 82,37 | 12,730 | 54 |

**Table 4-4: Levene's Test of Equality of Error Variances[a]**

Dependent Variable: Post Test

| F | df1 | df2 | Sig. |
|---|---|---|---|
| 1,558 | 1 | 38 | ,305 |

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Design: Intercept + PreTest + group

**Table 4-5: Tests of Between-Subjects Effects**

Dependent Variable: Post Test

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Corrected Model | 3218,309[a] | 2 | 1072,770 | 11,091 | ,000 | ,442 |
| Intercept | 7918,633 | 1 | 7918,633 | 81,868 | ,000 | ,661 |
| Pre-Test | 629,677 | 1 | 629,677 | 6,510 | ,014 | ,134 |
| *Group* | 2098,334 | 1 | 2098,334 | 21,630 | ,000 | ,341 |
| Error | 4062,409 | 42 | 447,797 | | | |
| Total | 319379,000 | 46 | | | | |
| Corrected Total | 7280,717 | 45 | | | | |

a. R Squared = ,442 (Adjusted R Squared = ,402)

Table 4-4 explains that ANCOVA outcome of the post-test analysis (p =. 305) suggests that there is no significant difference in educational effectiveness of VR tools supported instruction on individuals participating in the study.

### 4.3. The Effectiveness of VR Tools on Vocabulary Retention

The second question of the study aimed to investigate the effects of VR tools on vocabulary retention of the learners. This question was determined to find out whether there is a significant difference between control and experiment group in their follow-up test scores.

After treatment was completed, both groups returned to their normal classroom training for four weeks, and a follow-up test was administered to test the targeted vocabulary knowledge with both control and experimental groups at the end of this four-week interval. Results were analyzed by Independent Samples T Test.

**Table 4-6: Descriptive Statistics for Follow up Test Scores**

| | Group | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Follow Up Test | Control Group | 23 | 81,73 | 11,740 | 2,503 |
| | Experimental Group | 31 | 73,39 | 12,862 | 2,682 |

**Table 4-7: Independent Samples Test Results for Follow up Test Scores**

| | | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | | Lower | Upper |
| Follow Up Test | Equal variances assumed | ,474 | ,495 | 2,268 | 43 | ,028 | 8,336 | 3,676 | ,923 | 15,749 |
| | Equal variances not assumed | | | 2,272 | 42,910 | ,028 | 8,336 | 3,668 | ,937 | 15,735 |

The results of follow-up test scores did not show a significant difference between the control (M = 81.73 SD = 11.740) and the experimental (M = 73.39, SD = 12.863) groups as it is seen in Table 4.6 and Table 4.7 (p >0,05).

Tables 4.1, 4.3 and 4.6 (See also image 4-1) show the mean scores of the pre-test, post-test and follow-up test, respectively, for both groups. The control group started with an average score of 53.87 on the pre-test, increased to 87.57 after six weeks and showed a score of 34 points. However, in the follow-up test of the control group, the mean score decreased to 81.73 and showed a score of 28 points.

The experimental group, which started with an average score of 54.20 in the pre-test, increased to 77.17 in the post-test in six weeks, indicating a 23-point increase. The mean score in the follow-up test of the experimental group was 73.39, indicating a gain of approximately 19 points since the pre-test.

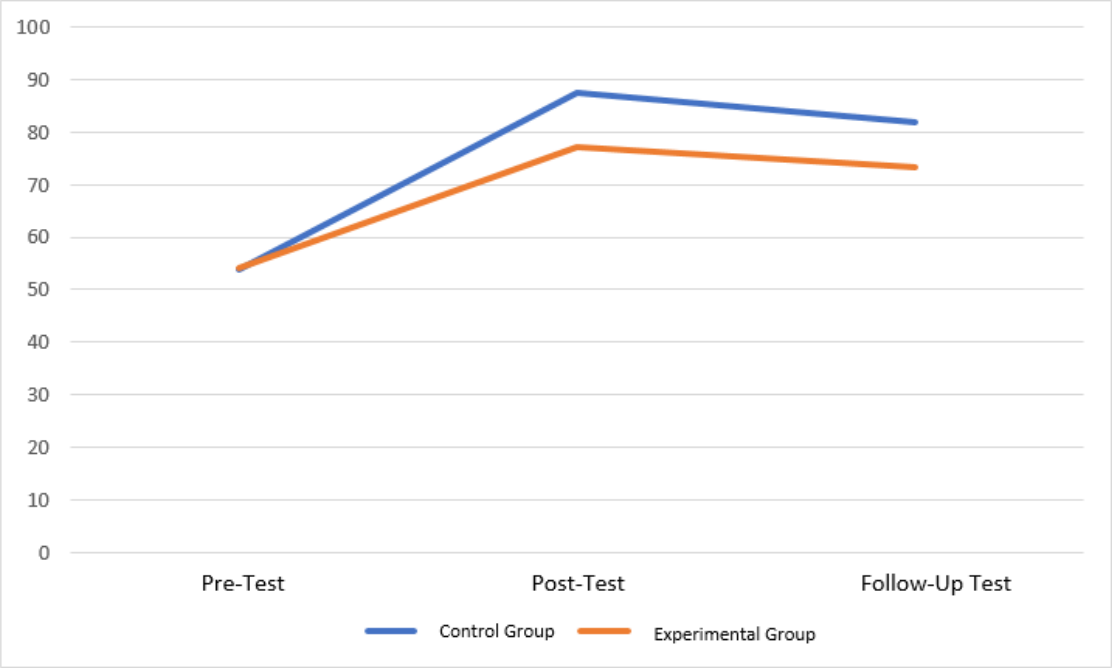



Image 4-1**:** Estimated Mean Scores of Pre-Test, Post-Test, and Follow-up Tests Results

### 4.4. The Students' Attitudes towards VR Tools

The objective of the third research question is to investigate the opinions of the students on the use of VR supported learning materials. Thus, the "Instructional Materials Motivation Questionnaire" (IMMQ) (See Appendix 2) was applied to the participants in the experimental group at the end of the training process. IMMQ was developed by Keller (1987) and the validity and reliability of the study and its translation were carried out by Kutu and Sözbilen (2011).

The questionnaire consists of 36 items in four factors (attention, conformity, trust, satisfaction). The questionnaire was translated into Turkish and then evaluated in terms of language and meaning getting the opinions of 15 lecturers from Turkish and foreign language specialists. After the evaluation, the cultural appropriateness of the questionnaire in terms of education system and Turkish language validity were reexamined by the experts. The questionnaire was administered to a total of 262 students in Atatürk and Erzincan University Education Faculties. Items total test correlations were calculated as evidence for item validity, and items with negative or very low correlation (r <30) with questionnaire scores were extracted. Questionnaire structure validity was analyzed by descriptive factor analysis. Because of the fact that the questionnaire was separated from the unrelated factors during the factor analysis, varimax vertical rotation technique was used. As a result of the analysis, the

questionnaire was found to be two factors and 24 questions. The reliability of the questionnaire (Cronbach Alpha) internal consistency coefficient was 0.83 for the total questionnaire and 0.79 and 0.69 for the sub-factors, respectively.

The following two questions were searched with the help of this questionnaire:

1. When you first learned the course contents, did you think that there is an interesting thing which attracts attention?

2. Did you enjoy studying in the lessons with the use of these materials?

**Table 4-8: Statistical Values of the Items of IMMQ**

| Madde | Minimum | Maximum | Ortalama | Standart Sapma |
|---|---|---|---|---|
| 1 | 2 | 5 | 4,26 | ,964 |
| 2 | 2 | 5 | 4,17 | 1,029 |
| 3 | 1 | 5 | 3,87 | 1,290 |
| 4 | 2 | 5 | 4,35 | ,832 |
| 5 | 3 | 5 | 4,43 | ,788 |
| 6 | 2 | 5 | 4,39 | ,988 |
| 7 | 3 | 5 | 4,48 | ,790 |
| 8 | 2 | 5 | 4,65 | ,775 |
| 9 | 2 | 5 | 3,96 | ,976 |
| 10 | 2 | 5 | 4,09 | ,949 |
| 11 | 3 | 5 | 4,39 | ,722 |
| 12 | 1 | 5 | 3,70 | 1,259 |
| 13 | 3 | 5 | 4,00 | ,853 |
| 14 | 1 | 5 | 3,78 | 1,536 |
| 15 | 2 | 5 | 4,09 | ,996 |
| 16 | 1 | 5 | 3,74 | 1,214 |
| 17 | 2 | 5 | 4,09 | ,848 |
| 18 | 1 | 5 | 3,55 | 1,402 |
| 19 | 1 | 5 | 4,17 | ,887 |
| 20 | 3 | 5 | 4,30 | ,559 |
| 21 | 3 | 5 | 4,57 | ,590 |
| 22 | 3 | 5 | 4,48 | ,665 |
| 23 | 3 | 5 | 4,04 | ,767 |
| 24 | 3 | 5 | 4,35 | ,775 |

In Table 4.8, descriptive statistical data of each question that are included in the questionnaire is shown. The data in this table reveals the opinions of the participants about whether they enjoyed the lessons. The answers of these questions will be interpreted in comparison with the values in Table 4.9.

**Table 4-9: Value Ranges of IMMQ**

| Arithmetic Mean (x) | Explanation |
|---|---|
| 1.00 - 1.80 | I never agree |
| 1.81 - 2.60 | I agree little |
| 2.61-3.40 | I agree |
| 3.41-4.20 | I agree very much |
| 4.21-5.00 | I totally agree |

The first eleven questions ask the question "When you first learned the course contents, did you think that there is an interesting thing which attracts attention?" and the arithmetic mean of these questions answers that question. The mean of these questions is 4.28. As it can be seen in Table 4.9, the participants said "I totally agree" on this question.

The other thirteen questions in the questionnaire answer the question of “Did you enjoy studying in the lessons with the use of these materials?”. The mean of these questions is 4.07. As it can be seen in Table 4.9, the participants said "I agree very much.".

In the light of this information, the VR tools supported vocabulary instruction attracted the attention of the participants who joined the study and seemed to be enjoyed by them. In other words, the participants seemed to like this type of instruction in general.

# PART V: DISCUSSION AND CONCLUSION

## 5.1. Introduction

In this chapter, the research findings about the effects of VR tools on vocabulary learning and retention will be discussed together with the opinions of the students towards these tools. Then, the limitations and implications of the study will be presented and some and suggestions for further study will be given.

## 5.2. Discussion of the Effectiveness of VR Tools Supported Materials on Vocabulary Learning

Rose and Billinghurst (1995) carried out a research using fully immersive head mounted display to teach Japanese prepositions. According to the research results, the researchers reported that a variety of approaches exist in fully immersive end of VR applications, such as Total Physical Response (Asher, et al., 1974) and Natural Approach (Baltra, 1992; Terrell, 1986). Furthermore, the immersive VR was qualified as a place where students were taught through direct demonstration without translating and where they can experience the silent periods while they were being exposed to voice commands. Rose and Billinghurst (1995) also underlines that due to the fact that learners are active participants in learning, VR addresses constructivism, as well. In all respects, the immersive VR tools that were used in the current study addresses all the methods mentioned above.

One of the obstacles in language learning is providing an authentic language learning environment in traditional classroom instruction (Little & Brammerts, 1996). VR with mobile viewer and the applications that were used in this study provided the students with real life situations e.g., a flat where they can visit, a supermarket where they can do the shopping or a jungle for the safari. In this respect, immersive VR tools can be considered as a great opportunity for education to provide learners with real life situations in virtual environments where the school structure and physical classroom limitations do not allow for real life experiences.

One of the features of adult learners is that they want to reach the goal and put the knowledge in practice (Schroeder, 1993). With the VR tools that were used in the current study, the students had the opportunity to practice their knowledge by doing the activities in a virtual environment.

The aim of this study was to introduce a new way of vocabulary learning, supported with immersive VR tools. Learning with VR tools was a new an unaccustomed experience for the students in the study. However, the course content excited them and they were enthusiastic about using this technology. As Naismith and Corlett (2006) emphasized, in order to have a successful learning, this technology was incorporated with standard classroom leaning and students' previous learning experiences. In the current study, the students were taught not only with VR tools but also with other traditional techniques.

In the current study, to investigate the effects of VR tools on EFL learners' vocabulary learning, the control and experimental groups were pre-tested to find out whether they were at the same level. The results of the pre-test showed that there was not a significant difference in the scores between control ($M = 53.87$, $SD = 12.048$) and experimental ($M = 54.2$, $SD = 12.129$) groups; $t(38) = -.511$, $p = 0.04$. Thus, the study was applied to both groups which were under equal conditions. The experimental group was instructed with VR tools for six weeks and the control group received traditional classroom instruction for the same period of time. After the instruction period ended, a post-test applied in order to observe any change in participants' vocabulary learning. Using the pre-test as covariate the results were analyzed and it was observed that both groups increased their score, but the experimental group remained almost ten points below the score of the control group. The outcome of the post-test analysis ($p = .305$) suggests that there is no significant difference in educational effectiveness of VR tools supported instruction on individuals participating in the study.

As the results show that the VR tools used in the study have positive impact on students' learning. During the study, the students were engaged with the activities, but they seemed confused with the use VR technology because it was a new thing that they did not experience before. At first, they felt frustrated while they were struggling to experience the applications and doing the tasks. When they got used to it they enjoyed.

However, after a short time many reported that their eyes were irritated and they had a feeling of dizziness. This caused them to spend short time in virtual environment. Due to the poor vision of Google Cardboard glasses and unimproved, very simple applications that were available for free in smartphones' stores, the students had the experience with the low quality VR tools. Even though the outcomes of the study reveal that learning took place for the experimental group that were instructed with the VR tools, control group increased its score almost ten points more. This is an evidence that the adult learners in the current study have adopted traditional education and achieved better in it. According to O'Connor (1997), learners need to trust the ways that they are instructed. The experimental group might have shown resistance against this new technique. In order to provide an effective learning, students' learning styles should be addressed (Claxton & Murrell, 1988). Yet, another issue that needs to be taken into consideration is that learning styles change with age, maturity and experience (Palloff & Pratt, 2003). Majority of the participants of both groups in this study were between 40-65-year-old who seemed to attached to traditional instructional methods. In spite of the VR tools attracted their attention, they preferred short visits when they were asked to fulfill the tasks that they were given. It was observed that the learners had difficulty in doing the activities they were given and they seemed to feel more comfortable with the traditional instruction. Additionally, it is possible that the low quality of VR tools which were used in this study might have driven the students to distraction.

In education there are always variables that are not easy to control. In this study, there is the student factor which was observed through instruction and assumed to affect the test results. First of all, considering the attendance, a number of students missed some classes and had no opportunity for compensation. Another concern is their performance on the tests. Some of them might have not performed well on the tests because they were not familiar with the test design and because they ignored the grades that they would take. These are the observed cases by the researcher and they need to be justified, perhaps in another study, for further and detailed discussion. In addition, the factors that were likely to affect the results that developed out of several other reasons might have interfere with the learning outcomes and the test results of the research, however they are out of the scope of this study.

### 5.3. Discussion of the Effectiveness of VR Tools on Vocabulary Retention

In order to investigate the effects of VR tools on vocabulary retention the follow-up test scores of the experimental and control groups were analyzed by Independent Samples T Test. The results of follow-up test scores did not show a significant difference between the control (M = 81.73 SD = 11.740) and the experimental (M = 73.39, SD = 12.863) groups. The experimental group, which started with an average score of 54.20 in the pre-test, increased to 77.17 in the post-test in six weeks, indicating a 23-point increase. The mean score in the follow-up test of the experimental group was 73.39, indicating a gain of approximately 19 points since the pre-test. The control group started with an average score of 53.87 on the pre-test, increased to 87.57 after six weeks and showed a score of 34 points. However, in the follow-up test of the control group, the mean score decreased to 81.73 and showed a score of 28 points.

The current study results suggest that VR tools supported instruction helped the retention of the targeted vocabulary in the memory. The students transferred the knowledge from short term memory to long term memory. There are important factors of good learning retention for adult learners to receive and keep the information: teachers should provide short learning sessions with clear learning objectives, practice right after instruction with real life experiences (Andriotis N., 2017, 24 April). To better fix the words in the memory, adult learners need direct connection with the materials to be learnt in their study (Schroeder, 1993). During the instruction, the students studied the targeted vocabulary gradually under three different topics with carefully planned objectives and they had the opportunity to use their knowledge in real contexts which were provided through VR environments and participated the lessons actively. The activities should address learners' various senses for the retention of the learning (Revington, 2013). Yet, VR has not matured enough to appeal to all senses; it mainly provides users with sight and hearing (Classen, 1997). However, it looks real, sound real, move and respond to interaction in real time, and even feel real (Brooks, 1999).

Formal L2 vocabulary instruction should employ different techniques and activities to address various learning styles. The variety of techniques and activities also serve for the revision of the material enabling learners to practice words for recalling from memory. The instruction should get students to encounter with the words several

times in order to keep them in long-term memory (Takaĉ, 2008). The VR tools that were used in the current study is one of the various ways to provide learners with practice of learning material at anytime and anywhere.

### 5.4. Discussion of the Opinions of Learners towards Using VR Tools Supported Learning Materials

The literature points out that new technologies are mostly adopted and maintained positive attitudes by their users (Grudin & Markus, 1997). According to the instructional material motivation questionnaire results which was used in the current study, the participants totally agreed that when they first learned the course contents, they thought that there is an interesting thing which attracts attention and they agreed very much that studying in the lessons with the use of these materials were enjoyable (See tables 4.8. and 4.9.). The students who participated in this study had positive attitude towards VR tools supported instruction. During the practice of instruction, the students seemed very excited, however they frequently reported that they had a feeling of aversion when they were operating in virtual environment. Most research indicates sickness symptoms that occur while using VR tools and applications (Kennedy, 1992; Regan, 1995). According to Mazuryk and Gervautz (1996), there are many factors which causes that feeling. One of them is hardware defect that results in providing poor stimuli to human senses. The head tracking in Google Cardboard and phones causes headaches and motion sickness (Hussein & Nätterdal, 2015).

### 5.5. Limitations of the Study

The study was conducted for 9-week period of instruction in 2018 academic term in Istanbul with a small number of participants. It was carried out with 54 elementary level adult learners (31 participants in experimental group and 23 participants in the control group) who were between 20-65 years old. So, the time of the instruction, the number of the students do not allow to make generalization. Other limitation was about the VR tools that were used in the study. The applications were limited to the ones which were compatible with versions of IOS and Android operating systems and available for free in the stores of the smartphones. Additionally, the smartphones which do not have gyroscope are not able to discern the movement of the

device in 3D space. In the study, the students with smartphones without this movement tracking could not use their phones to experience VR. Furthermore, the wearable viewer, which was Google Cardboard, was the simplest and cheapest version of the HDMs. It gave the students low quality of VR experience comparing to the other high quality, upgraded versions giving the feeling of fatigue in a short time.

### 5.6. Implications of The Study

VR has a huge potential for education. The outcome of the current study also revealed that the VR tools were effective in vocabulary learning and retention for adult learners. Despite its potential, the technology in general has not been utilized in education effectively. Specifically, VR is exploited in education very rarely. There are many reasons for its underuse for educational purposes, such as money investment, time and syllabus restrictions, lack of expertise, the interest of software developers and the lack of enough research in that field.

There are some issues to consider the use of VR tools. While studying with VR tools, the teacher should select flexible tasks to cater for students' self-efficacy. Otherwise, it might cause task frustration resulting in developing negative attitudes toward VR. In addition to this, it is important to make sure that students are provided with appropriate support during their interaction with VR tools to decrease level of frustration and increase the level of performance. Another issue is the time limit. Spending a long time in VR leads to mental and physical discomfort. As it was the case in the current study, it is possible to occur some complaints, such as nausea, eyestrain and headaches caused by VR tools if there is not a time limitation of use. Educators need to learn what precautions to be taken in order to decrease the bad effects of VR tools on people and follow the instructions to use it safely. But the bigger issues may be about what these virtual experiences do to our minds, rather than our bodies. The long-term effects of VR are still being debated.

Another important issue that needs to be considered is the amount of space that is needed while experiencing VR with headsets where your vision is completely blocked off. The amount of space is changes according to the type of your VR

experience. If it requires a seated experience, then only the area of your desk and chair is enough. If your study requires a standing VR experience that the users need to walk around to fulfill the tasks and get the best view, then at least 1 meter by 1 meter area is necessary for a person. However, a larger area is preferable for a safer and more comfortable VR experience (O'Donnell, 2018). Otherwise, students may stumble and some physical damages may occur. The classroom area in this study was also very limited, hence the students was not very comfortable as if they were walking on the ice. Some students asked their friends help them in order not to hit somewhere (See image 5-1). This problem hindered the fully immersion feeling and caused some distraction and delay in completing the activities. To get rid of the space problems there are VR walkers (See image 5-2) available on the market to provide safe and fully immersive VR experience. This brings another concern into education with VR in terms of budgets planning.

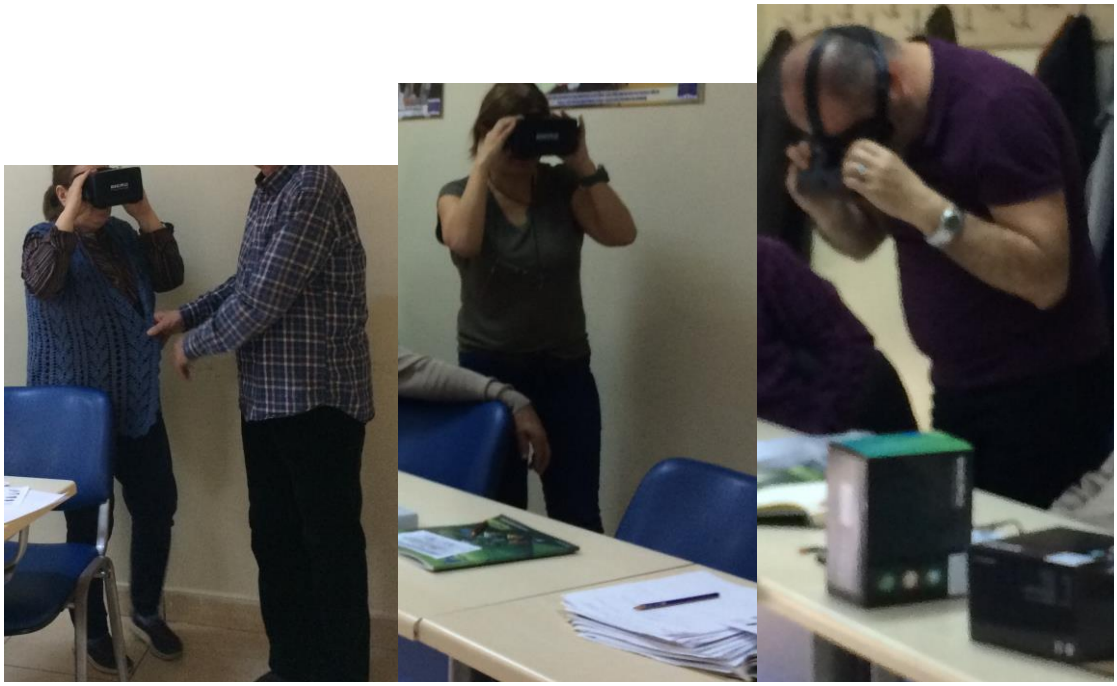


Image 5-1: Limited space for VR experience
Photos taken in the classroom

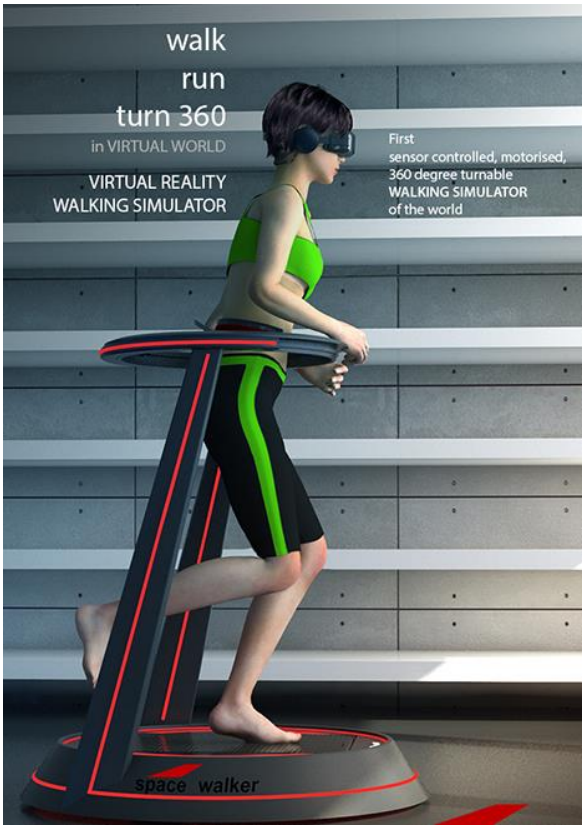


Image 5-2: Safe VR experience with a VR walker [7]

It is possible that some smartphones do not display VR applications due to the lack of gyroscope sensor. This problem occurred in this study, as well. After noticing it, the researcher provided the students, whose mobiles were not suitable to display VR applications, with smartphones that work with the applications. Hence, it is important to make sure that the smartphones that will be used in VR experience should have gyroscope and other related sensors to start a VR experience. Furthermore, in order to have a higher quality of VR experience the high quality versions of headsets should be preferred (See image 5-3) This will probably improve the learning outcomes and test results.

It is commonly believed that older people are not comfortable with technology and young people are more inclined to technologic devices than older people. Young people might be considered better technology users, however, older people are also potential users of technology. The students who participated in the current study were adults and they indicated that they enjoyed the VR tools supported lessons and the lessons attracted their attention. For this reason, designers and developers of VR

technology should consider older people as well. It is also obvious that children do not learn the best by reading books in a classroom setting. For this reason, the potentials of immersive VR tools should be exploited in young learners' education, as well. Despite the fact that children are more vulnerable to the effects of VR, if it is used appropriately, VR has potential to attract the attention of the students, engage them in the subject matter and arise their enthusiasm in learning.

With the appearance of Google Cardboard headsets at an affordable price, the VR has become available for everyone who has a smartphone. However, the majority of these devices are not capable of running good virtual experiences today. Yet, the advancement in technology suggests that immersive virtual reality will be part of daily life of many people in the near future, forcing the boundaries of imagination. For instance, having a seat at a football match, studying in a classroom of students and teachers or seeing a doctor face-to-face just by putting on googles in your home are no longer a dream. Particularly, VR will be a great advantage in education for the students who cannot go to school for some reasons, giving the opportunity to attend the classes from home.

It is admitted that technology is inseparable part of our life. It should definitely be exploited in education. Yet, there is a need for investment and expertise in development of VR in the field of language teaching. It is also necessary to wait until the findings from many research yield valuable data on using it in education and several studies need to be carried out to explore what works, especially in language teaching. Furthermore, it is necessary to think about the consequences of using VR on individuals and, in a broad sense, on society. The effective use of VR is ought to prevent people from isolation, especially when VR involves shutting yourself off from the world around you by wearing a headset. This is today's issue where too many people have difficulty in having relations with physical world around them because they are staring down at a smartphone or tablet screen.

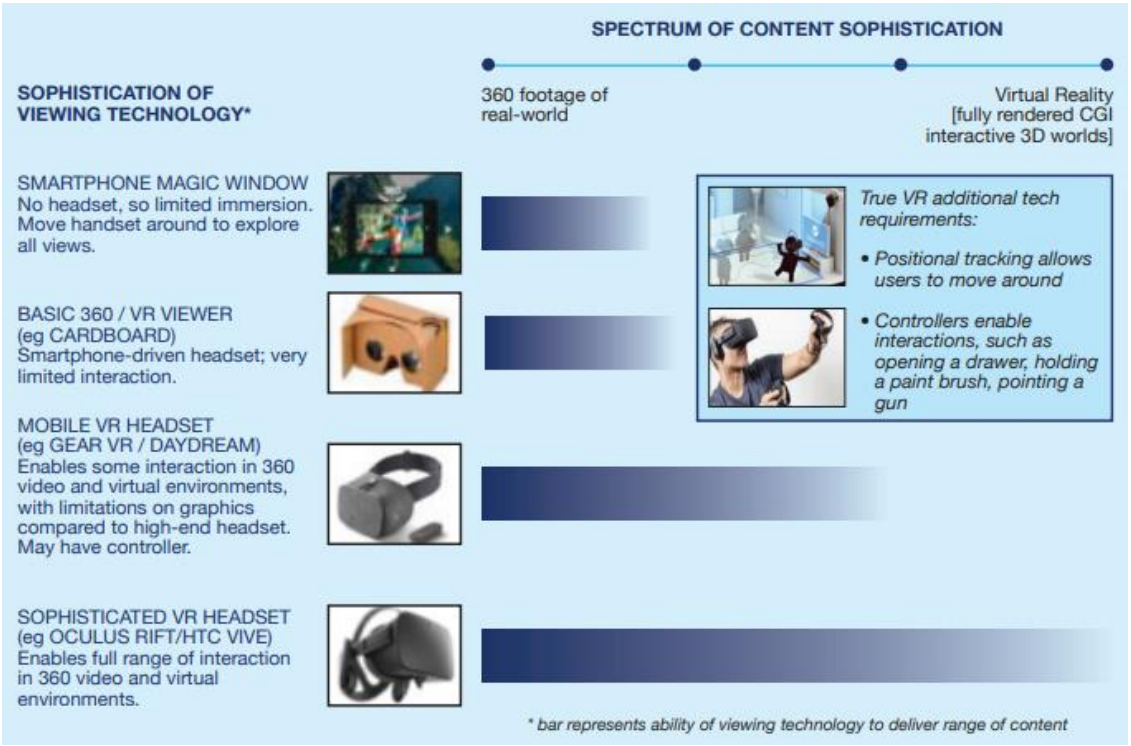


Image 5-3: Advancement in Viewing Technology [8]

### 5.7. Suggestions for further study

Everyone does not react in the same way when experiencing VR. Research shows that age, gender, cognitive ability, imagination, and personality can affect how one reacts to VR. In this respect, these features could be searched in another study. In the current study, the participants, who were considered as older age group, had less prior experience with technology in general. The prior experience in VR might have some effects on comfort, competence and efficacy when using it effectively and it needs to be searched. The effects of VR tools on older and younger people can be tested to see age-related factors, if there exist, in respect to achievement and attitudes toward many aspects of VR. Especially, education with VR can make difference for disabled people and experiments could be carried out to verify this hypothesis. Though its usage is restricted with children, immersive VR could be utilized in their education with the guidance of teacher in order to see the effects of VR tools in learning and memorization of the objects that are not accessible in reality.

## REFERENCES


Abeywickrama, P., & Brown, H. D. (2010). *Language assessment: Principles and classroom practices.* NY: Pearson Longman.

Adjemian, C. (1983). The transferability of lexical properties. In S. Gass and L. Selinker (Eds.), *Language Transfer in Language Learning* (pp. 250–268). Rowley, MA: Newbury House.

Ahmed, S. and Parsons, D. (2013). Abductive science inquiry using mobile devices in the classroom. *Computers & Education. 63*(4) 62–72.

Abulrub, A. H. G., Attridge, A. N., & Williams, M. A. (2011, April). Virtual reality in engineering education: The future of creative learning. *In Global Engineering Education Conference (EDUCON), 2011 IEEE* (pp. 751-757). IEEE.

Alderson, J. C. & Banerjee, J. (2001). Language testing and assessment (Part 1). *Language Teaching*, 34, 213-236.

Alderson, J. C. & Banerjee, J. (2002). Language testing and assessment (Part 1). *Language Teaching*, 35, 79-113.

Allen, K., Austin, T., Beach, R., Bergstrom, A., Exon, S., Fabri, M., et al. (2002). *Creating and using virtual reality: A guide for the arts and humanities.* Retrieved: March 16, 2008, from http://vads.ahds.ac.uk/guides/vr_guide/sect11.html

Allison, D., & Hodges, L. F. (2000). *Virtual reality for education*. Paper presented at the ACM Symposium on Virtual Reality Software and Technology, Seoul, Korea.

Andriotis N. (2017, 24 April). *Make Your eLearning Stick: 8 Tips & Techniques. For Learning Retention.* Retrieved: 2018, 20 May, https://www.talentlms.com/blog/8-tips-techniques-learning-retention/

Armstrong, T. (1994). *Multiple intelligences in the classroom. Association for supervision and curriculum development.* Virginia: Association for Supervision and Curriculum Development.

Arts and Humanities Data Service (2002). *Creating and using virtual reality: A guide for the arts and humanities.* Retrieved February 21, 2004, from http://vads.ahds.ac.uk/guides/vr_guide

Asher, J., Kusudo, J., & Torre, R.D.L. (1974). Learning in a second language through commands: The second field test. *Modern Language Journal, 58,* 24-32.

Astheimer, P., Dai, F., Göbel, M., Kruse, R., Müller, S., & Zachmann, G. (1994). *Realism in virtual reality.* In N. Magnenat Thalmann & D. Thalmann, Artificial life and virtual reality (pp. 189–209). New York, NY: John Wiley.

Ausburn, L. J., & Ausburn, F. B. (2003a, December). *Virtual reality at your desktop. Paper presented at the meeting of the Association for Career and Technical Education,* Orlando, FL.

Aydede, M.N. & Matyar, F. (2009). Fen bilgisi öğretiminde aktif öğrenme yaklaşımının bilişsel düzeyde öğrenci başarısına etkisi. *Türk Fen Eğitimi Dergisi, 6*(1), 115-127.

Bachman, L. & Palmer, A. S. (1996). *Language testing in practice*. New York: Oxford University Press.

Bachman, L. (2002). Some reflections on task-based language performance assessment. *Language Testing,* 19, 453-476.

Baltra, A. (1992). On breaking with tradition: The signi®cance of Terrell's natural approach. *Canadian Modern Language Review, 48*(3), 564-591.

Bamodu, O., & Ye, X. M. (2013a). Virtual Manufacturing and Components of Virtual Reality. In *Applied Mechanics and Materials, Vol. 318*, pp. 83-86. Trans Tech Publications.

Bamodu, O., & Ye, X. M. (2013b). Virtual reality and virtual reality system components. *In Advanced Materials Research*. *Vol. 765*, pp. 1169-1172. Trans Tech Publications.

Basu, A., & Johnsen, K. (2014, March). Ubiquitous virtual reality 'To-Go'. In *Virtual Reality* (VR), *2014 iEEE* (pp. 161-162). IEEE.

Beier, K. P. (2004). *Virtual reality: A short introduction*. Retrieved February 20, 2004, from http://www-vrl.umich.edu/intro/index.html

Belenky, M. F., Clinchy, B. M., Goldberger, N. R., and Tarule, J. M. (1986). *Women's Ways of Knowing: The Development of Self, Voice, and Mind*. New York: Basic Books.

Berman, I. M., Buchbinder, V. A., and Beznedeznych, M. L. (1968). Formirovanie potentialnogo slovarnogo pri obuchenii russkomu jazyku kak inostrannomu [Forming a potential vocabulary in teaching Russian as a foreign language]. *Russkij jazyk za rubezˇom, 4,* 57–60.

Beier, K. P. (2004). *Virtual reality: A short introduction*. Retrieved February 20, 2004, from http://www-vrl.umich.edu/intro/index.html

Bell J. T. and Fogler, H. S. (2004). The application of virtual reality to chemical engineering education. *VR, (4),* 217–218.

Bialystok, E. (1979). The Role of Conscious Strategies in Second Language Proficiency. *Canadian Modern Language Review*, 35(3), 372-94.

Bialystok, E., & Sharwood Smith, M. (1985). Interlanguage is not a state of mind: An evaluation of the construct for second-language acquisition. *Applied linguistics*, *6*(2), 101-117.

Bimmel, P. (1993). Lernstrategien im Deutschunterricht. *Fremdsprache Deutsch* 8 (1), 4-11.

Blachowicz, C. L., Fisher, P. J., Ogle, D., & Watts-Taffe, S.M. (2006). Vocabulary: Questions from the classroom. *Reading Research Quarterly,* 41(4), 524-539.

Bricken, M. (1991). Virtual reality learning environments: potentials and challenges. *ACM SIGGRAPH Computer Graphics, vol. 25*(3), 178–184.

Britain, S. (1999). *A framework for pedagogical evaluation of virtual world learning environments.* JISC Technology Applications Programme, Report 41: Joint Information Systems Committee of the Higher Educational Funding Council. Manchester, UK.

Bronack, S.C. 2009. The Role of Immersive Media in Online Education. *2nd IEEE International Conference on Computer Science and Information Technology,* 73–78.

Brooks Jr, F. P. (1987, January). Walkthrough—a dynamic graphics system for simulating virtual buildings. *In Proceedings of the 1986 workshop on Interactive 3D graphics* (pp. 9-21). ACM.

Brooks, F. P. (1999). What's real about virtual reality? *IEEE Computer Graphics and Applications,* 19(6), 16–27. doi:10.1109/38.799723

Brown, R. D. (2001). *Welcome to the world of virtual reality.* Retrieved February 8, 2004, from http://www.crd.rca.ac.uk/staff/richard/vr.html Note: The url provided above returned invalid results. The link above will direct you to the following url: http://www.rca.ac.uk/index.html

Bulu, T.S. ve İşler, V. (2011). Second Life Odtü Kampüsü. Akademik Bilişim Kongre Bildirisi 2011, www.ab.org.tr, İnönü Üniversitesi, Malatya.

Burdea, G. C., & Coiffet, P. (2003). *Virtual reality technology* (2nd ed.). New Brunswick, NJ: Wiley IEEE Press.

Canale, M. & Swain, M. (1980). Theoretical basis of communicative approaches to second language teaching and testing. *Applied Linguistics, 1*, 1-47.

Carter, R., & McCarthy, T. (1988). *Vocabulary and language teaching*. New York: Longman.

Carter, R. (1992). *Vocabulary: Applied Linguistic Perspectives.* London and New York: Routledge.

Chapelle, C. A., & Jamieson, J. (2008). Tips for teaching with CALL. *White Plains*, NY: Pearson Education.

Chee, Y. M. (2001). *Virtual Reality in Education: Rooting Learning in Experience*. Invited talk. In Proceedings of the International Symposium on Virtual Education, Busan, South Korea.

Chi, H.-L., Kang, S.-C. and Wang, X. (2013). Research trends and opportunities of augmented reality applications in architecture, engineering, and construction. *Automation in Construction. 33*, 116–122.

Chen, C.-C. and Huang, T. C. (2012). Learning in a u-Museum： Developing a context-aware ubiquitous learning environment. *Computers & Education*. November, *59*(3), 873– 883.

Classen, C. (1997). Foundations for an anthropology of the senses. International Social *Science Journal, 49*(153), 401-412.

Claxton, C. S., and Murrell, P. H. (1988). *Learning Styles*. Washington, D.C.: ERIC Clearinghouse on Higher Education.

Coady, J., Magoto, J., Hubbard, P., Graney, J., and Mokhtari, K. (1993). High frequency vocabulary and reading proficiency in ESL readers. In T. Huckin, M. Haynes, and J. Coady (Eds.), *Second Language Reading and Vocabulary Learning* (pp. 217–228). Norwood, NJ: Ablex.

Cohen, A.D. (1998). *Strategies in learning and Using a Second Language*. New York: Addison Wesley Longman.

Crosier, J. K., Cobb, S. V. G., & Wilson, J. R. (2000). Experimental comparison of virtual reality with traditional teaching methods for teaching radioactivity. *Education and Information Technologies, 5*(4), 329-343.

Cziko, G. A. (1982). Improving thr psychometric, criterion-referenced, and practical qualities of integrative language tests. *TESOL Quarterly, 16,* 367-379.

Dale, E., & O'Rourke, J. (1986). Vocabulary building. Columbus, Ohio: Zaner-Bloser.

Dalgarno, B., Hedberg, J., & Harper, B. (2002). *The contribution of 3D environments to conceptual understanding.* Paper presented at the ASCILITE 2002, Auckland, New Zealand.

Dalgarno, B. & Lee, J. W. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology, 41(*1), 10- 32.

D'Anastasio C. (21 June, 2017). *Hands-On With Sansar, The New Second Life*. Retrieved: 23 May, 2018. https://kotaku.com/hands-on-with-project-sansar-the-new-second-life-1796312409

Dani, T.H. &. Rajit, G. (1998). *Virtual Reality - A New Technology for the Mechanical Engineer In: Mechanical Engineers' Handbook*, 2nd ed., ed. Meyer Kutz. John Wiley & Sons, Inc., New York, pp. 319-327

Detlefsen, J. (2014). The Cosmic Perspective: Teaching Middle-School Children Astronomy Using Ego-Centric Virtual Reality.

Descamps, J. L. (1992). *Towards classroom concordancing*. Basingstoke, Hants: Macmillan.

Dewey, J. (1916). Democracy and education. New York: The Free Press (1966).

Dickey, M. D. (2005a). Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance education, *British Journal of Educational Technology. 36*, 439-451.

Dickey, M. D. (2005b). Brave new (interactive) worlds: A review of the design affordances and constraints of two 3D virtual worlds as interactive learning environments. *Interactive Learning Environments*, *13*(1-2), 121-137.

Dreyer, C., & Oxford, R. L. (1996). Learning strategies and other predictors of ESL proficiency among Afrikaans speakers in South Africa. *Language learning strategies around the world: Cross-cultural perspectives*, 61-74.

Du, X., & Arya, A. (2015). Design and Evaluation of a learning assistant system with optical head-mounted display (OHMD). In *Learning and Collaboration Technologies* (pp. 75-86). Springer, Cham.

Durlach, N. I., & Mavor, A. S. (1995). Virtual reality. *Scientific and technological challenges.* Washington DC: National Academy Press.

Elbaum, B. E., Berg, C. A., & Dodd, D. H. (1993). Previous learning experience, strategy beliefs, and task definition in self-regulated foreign language learning. *Contemporary Educational Psychology*, 18(3), 318-336.

Ehrman, M., & Oxford, R. (1989). Effects of sex differences, career choice, and psychological type on adult language learning strategies. *The Modern Language Journal*, 73(1), 1-13.

Ellis, N. C. (1997). *Vocabulary acquisition: Word structure, collocation, grammar, and meaning.* Cambridge University Press.

Ellis, R. (1995). *The study of second language acquisition*. Oxford: Oxford University Press.

Ellis, R., and He, X. (1999). The roles of modified input and output in the incidental acquisition of word meanings. *Studies in Second Language Acquisition,* 21, 285–301.

Ellis, R., Johnson, K. E., & Harley, B. (2000). Listening strategies in ESL: Do age and L1 make a difference? *TESOL Quarterly*, 34(4), 769-777.

Elmas, R., & Geban, Ö. (2012). 21. Yüzyıl Öğretmenleri İçin Web 2.0 Araçları. *International Online Journal of Educational Sciences, 4*(1), 243- 25441–54.

Encyclopædia Britannica. (2015). *Virtual Reality (VR).* Encyclopædia Britannica Online.

Estes, J. S., Dailey-Hebert, A., Choi, D. H., & Choi, D. H. (2016). Integrating technological innovations to enhance the teaching-learning process. *Emerging Tools and Applications of Virtual Reality in Education*, 277-304.

Fällman, D. (2000). *Virtual reality in education: On-line survey*. Retrieved: 14 May 2007, from http://www.informatik.umu.se/~dfallman/projects/vrie

Fox, C., Furmanski, W., Nilan, S., Small,V. (1994, January). *Assessing Virtual Reality for Education*. Syracuse University.

Freina, L., & Ott, M. (2015, January). A literature review on immersive virtual reality in education: state of the art and perspectives. *In The International Scientific Conference eLearning and Software for Education* (Vol. 1, p. 133). " Carol I" National Defence University.

Friedman, T. (2005). *The world is flat. Farrar, Straus and Giroux*. New York: MacMillan Publishers.

Fulcher, G. (2000). The "Communicative" Legacy in Language Testing. *System,* 28, 483-497.

Furlan, R. (2013). This Wearable Computer Augments the Self, not Reality. *IEEE Spectrum.*

Garb, Y. (Winter 1987). Virtual Reality, *Whole Earth Review (57)*: 118ff.

Gardner, H. (1983). *Frames of Mind: The theory of multiple intelligences.* New York, NY: Basic Books.

Gardner, H. (1999). *Intelligence reframed: Multiple intelligences for the 21st century*. New York, NY: Basic Books.

Gass, S. (1999). Discussion: incidental vocabulary learning. *Studies in Second Language Acquisition*, 21, 319–333.

Gass, S. M., & Selinker, L. (2008). *Second language acquisition: An introductory course.* Routledge.

Genesee, F., & Upshur, J. A. (1996). *Classroom-based evaluation in second language education.* Cambridge University Press.

Green, J. M., & Oxford, R. (1995). A closer look at learning strategies, L2 proficiency, and gender. *TESOL quarterly*, 29(2), 261-297.

Grudin, J., & Markus, M. L. (1997). *Organizational issues in development and implementation of interactive systems.* In M. G. Helander, T. K. Landauer, & P. V. Prabhu (Eds.), Handbook of human-computer interaction (2nd ed., pp. 1457-1475). Amsterdam: Elsevier Publishing.

Gu, Y., and Johnson, R. (1996). Vocabulary learning strategies and language learning outcomes. *Language Learning*, 46, 643–679.

Gustafson, K. L. (2002). *The future of instructional design*. In R. A. Rieser & J. V. Dempsey (Eds.), Trends and issues in instructional design and technology. New Jersey: Prentice Hall.

Gutiérrez, M. A., Vexo, F., & Thalmann, D. (2008). *Stepping into virtual reality.* England: Springer-Verlag London.

Ha, K., Chen, Z., Hu, W., Richter, W., Pillai, P. and Satyanarayanan, M. (2014). Towards wearable cognitive assistance. *Proceedings of the 12th annual international conference on Mobile systems, applications, and services - MobiSys '14*, New York, USA, 68–81.

Hashemipour, M., Manesh, H. F., Bal, M. (2011). A modular virtual reality system for engineering laboratory education, *Computer Applications in Engineering Education, vol. 19*(2), pp. 305–314.

Haynes, M., and Baker, I. (1993). American and Chinese readers learning from lexical familiarizations in English text. In T. Huckin, M. Haynes, and J. Coady (Eds.), *Second Language Reading and Vocabulary Learning* (pp. 130–150). Norwood, NJ: Ablex.

Helman, L. (2008). English words needed: Creating research-based vocabulary instruction for English learners. *What research has to say about vocabulary instruction*, 211-237.

Huckin, T., & Haynes, M. (1993). Summary and future directions. Coady (eds.) *Second Language Reading and Vocabulary Learning*, 289-298. Norwood, NJ: Ablex.

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

Hulstijn, J. H. (1997). 1 Q Mnemonic methods in foreign language vocabulary learning. Second language vocabulary acquisition: *A rationale for pedagogy*, 203.
Hulstijn, J., and Laufer, B. (2001). Some empirical evidence for the involvement load hypothesis in vocabulary acquisition. *Language Learning,* 51, 539–558.

Hatch, E. and Brown, C. (2000). *Vocabulary, Semantics, and Language Education* (3rd printing). Cambridge: Cambridge University Press.

Huang, H. M., Liaw, S. S., & Lai, C. M. (2016). Exploring learner acceptance of the use of virtual reality in medical education: a case study of desktop and projection-based display systems. *Interactive Learning Environments, 24*(1), 3-19.

Hussein, M., & Nätterdal, C. (2015). The Benefits of Virtual Reality in Education – A comparison Study.

Imagining the Classroom of 2016, Empowered by Wearable Technology: 2014. http://www.emergingedtech.com/2014/04/imaging-the-classroom-of-2016-empowered-bywearable-technology/. Accessed: 2014-07-24.

Jamieson, J. (2005). Trends in computer-based second language assessment. *Annual Review of Applied Linguistics*, 25, 228-242.

Jeffries, P. R., Woolf, S., & Linde, B. (2003). Technology-based vs. traditional instruction: A comparison of two methods for teaching the skill of performing a 12-lead ECG. *Nursing Education Perspectives*, 24(2), 70-74.

Jennett, C., Cox, A. L., Cairns, P., Dhoparee, S., Epps, A., Tijs, T., & Walton, A. (2008). Measuring and defining the experience of immersion in games. *International journal of human-computer studies*, 66(9), 641-661.

Jiang, N. (2000). Lexical representation and development in a second language. *Applied Linguistics,* 21, 47–77.

Jiang, N. (2002). Form–meaning mapping in vocabulary acquisition in a second language. *Studies in Second Language Acquisition*, 24, 617–637.
Jiang, N. (2004). Semantic transfer and its implications for vocabulary teaching in a second language. *Modern Language Journal*, 88, 416–432.

Johansson, S. (1978). *Studies in Error Gravity: Native Reactions to Errors Produced by Swedish Learners of English*. Göteberg, Sweden: Acta Universitatis Gothoburgensis.

Jonassen, D. H. (1994). Thinking technology: toward a constructivist design model. *Educational Technology*, *34*(2), 34-37.

Jonassen, D. H. (2000). Transforming learning with technology: Beyond modernism and post-modernism or whoever controls the technology creates the reality. *Educational Technology*, *40*(2), 21-25.

Judd, E. L. (1978). Vocabulary teaching and TESOL: A need for reevaluation of existing assumptions. *Tesol Quarterly,* 12 (1), 71-76.

Karasar, N. (2010). Bilimsel Arastırma Yöntemi-Kavramlar, İlkeler, Teknikler. 21. *Baskı, Ankara: Nobel. Yayınevi*.

Kasper, L. F. (1993). The keyword method and foreign language vocabulary learning: A rationale for its use. *Foreign Language Annals*, 26(2), 244-251.

Kelly, P. (1986). Solving the vocabulary retention problem. *ITL-International Journal of Applied Linguistics*, *74*(1), 1-16.

Kennedy, R. S., Lane, N. E., Lilienthal, M. G., Berbaum, K. S., & Hettinger, L. J. (1992). Profile analysis of simulator sickness symptoms: Application to virtual environment systems. *Presence: Teleoperators & Virtual Environments, 1*(3), 295-301.

Kim, J. H., Park, S. T., Lee, H., Yuk, K. C., & Lee, H. (2001). *Virtual reality simulations in physics education.* Retrieved Oct 11, 2007, from http://imej.wfu.edu/articles/2001/2/02/index.asp

Ko, C. C., & Cheng, C. D. (2009). *Interactive web-based virtual reality with Java 3D*. The United States of America: Information Science Reference.

Keller, J. M. (1987). IMMS: *Instructional materials motivation survey*. Tallahassee, Florida: Florida State University.

Koda, K. (1989). The effects of transferred vocabulary knowledge on the development of L2 reading proficiency. *Foreign Language Annals*, 22, 529–540.

Kutu, H., & Sozbilir, M. (2011). Adaptation of Instructional Materials Motivation Survey to Turkish: A Validity and Reliability Study. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education, 5*(1), 292-312.

Lan, R., & Oxford, R. L. (2003). Language learning strategy profiles of elementary school students in Taiwan. *IRAL*, 41(4), 339-380.

Lang, B. (2017, 15 January). *'Sansar' Will Open to All in First Half of 2017 with a New Approach to Virtual Worlds.* Retrieved: 23 May 2018. https://roadtovrlive-5ea0.kxcdn.com/wp-content/uploads/2017/01/sansar-linden-lab-5.jpg

Larsen-Freeman, D. (1986). *Techniques and Principles in Language Teaching*. New York: Oxford University Press.

Laufer, B. (1990). Ease and difficulty in vocabulary learning: Some teaching implications. *Foreign Language Annals*, 23(2), 147-155.

Laufer, B. (1991). The development of the L2 lexis in the expression of the advanced learner. *The Modern Language Journal*, 75 (4), 440-448.

Laufer, B. (1997). The lexical plight in second language reading: Words you don't know, words you think you know, and words you can't guess. Second language vocabulary acquisition.

Laufer, B. (1997a). The lexical plight in second language reading: Words you don't know, words you think you know, and words you can't guess. In J. Coady and T. Huckin (Eds.), *Second Language Vocabulary Acquisition: A Rationale for Pedagogy* (pp. 20–33). Cambridge: Cambridge University Press.

Laufer, B. (1997b). What's in a word that makes it hard or easy: some intralexical factors that affect the learning of words. In N. Schmitt and M. McCarthy (Eds.), *Vocabulary: Description, Acquisition and Pedagogy* (pp. 140–180). Cambridge: Cambridge University Press.

Laufer, B. (1998). The development of passive and active vocabulary in a second language: same or different? *Applied Linguistics, 19,* 255–271.

Laufer, B., and Paribakht, S. (1998). The relationship between passive and active vocabularies: effects of language learning context. *Language Learning, 48*, 365–391.

Laufer, B., and Hulstijn, J. (2001). Incidental vocabulary acquisition in a second language: the construct of task-induced involvement. *Applied Linguistics, 23*, 1–26.

Lee, J. (1999). Effectiveness of computer-based instructional simulation: A Meta-analysis. *International Journal of Instructional Media, 26*(1): 71–85.

Lee, E. A.-L., & Wong, K. W. (2008). A review of using virtual reality for learning. *Transactions on Edutainment 1*, LNCS 5080, 231-241.

Lee, E. A.-L., Wong, K. W., & Fung, C. C. (2009a*). Educational values of virtual reality: The case of spatial ability.* In C. Ardil (Ed.), Proceedings of World Academy of Science, Engineering and Technology. Paris, France.

Leite, W. L., Svinicki, M., & Shi, Y. (2010). Attempted validation of the scores of the VARK: Learning styles inventory with multitrait–multimethod confirmatory factor analysis models. *Educational and Psychological Measurement*, 70(2), 323-339.

Leung, C., & Lewkowicz, J. (2006). Expanding horizons and unresolved conundrums: Language testing and assessment. *TESOL Quarterly*, *40*, 211-234.

Lewis, M. (1993). *The lexical approach*. Hove: Language Teaching Publications.

Lewis, M. (2000b). There is nothing as practical as a good theory. In M. Lewis (ed.) *Teaching Collocation: Further Developments in the Lexical Approach (pp.10-27). Hove: LTP Teacher Training.*

Little, D., & Brammerts, H. (Eds.). (1996). *A guide to language learning in tandem via the Internet.* CLCS Occasional Paper (Vol. 46). Dublin: Trinity College, Centre for Language & Communication Studies.

Liu, W., Cheok, A. D., Lim, C. M. L., & Theng, Y. L. (2007). *Mixed reality classroom—learning from entertainment.* Paper presented at the Second International Conference on Digital Interactive Media in Entertainment and Arts, Perth, Australia.

Liu, Y. (2014, July). Virtual neurosurgical education for image-guided deep brain stimulation neurosurgery. In Audio, Language and Image Processing (ICALIP), 2014 International Conference on (pp. 623-626). *IEEE.*

Lee, J. (1999). Effectiveness of computer-based instructional simulation: A Meta-analysis. *International Journal of Instructional Media*, 26(1): 71–85.

Meara, P. (1978). Learners' word associations in French. *Interlanguage Studies Bulletin, 43,* 192–211.

Meara, P. (1984). The study of lexis in interlanguage. In A. Davies, C. Criper, and A. Howatt (Eds.), *Interlanguage* (pp. 225–235). Edinburgh: University of Edinburgh Press.
Magnenat-Thalmann, N., & Thalmann, D. (1999). Virtual reality software and technology. Encyclopedia of Computer Science and Technology, *Marcel Dekker,* 41.

Mantovani, F., Gaggiolo, A., Castelnuovo, G., & Riva, G. (2003). Virtual reality training for health-care professionals. *CyberPsychology and Behavior,* 6(4), 389-395.
Mazuryk, T., & Gervautz, M. (1996). *Virtual reality, history, applications, technology and future, 1-72. Institute of Computer Graphics,* Vienna University of Technology, Austria. Retrieved August 29, 2015 from https://www.cg.tuwien.ac.at/research/publications/1996/mazuryk-1996-VRH/TR-186-2-96-06Paper.pdf

McArdle, G., Monahan, T., Bertolotto, M., & Mangina, E. (2004). *A web-based multimedia virtual reality environment for e-learning.* Paper presented at the Eurographics.

McLellan, H. (2004). *Virtual Realities.* In D. H. Jonassen (Ed.), Handbook of Research on Educational Communications and Technology. Mahwah, NJ: Erlbaum Associates, Mahwah, NJ.

Melka, F. (1997). Receptive vs. productive aspects of vocabulary. *Vocabulary: Description, Acquisition and Pedagogy*, 33(2), 84-102.

Merchant, Z., Goetz, E. T., Cifuentes, L., KeeneyKennicutt, W., Davis,T. J (2014). Effectiveness of virtual reality-based instruction on students' learning outcomes in k-12 and higher education: A metaanalysis, *Computers & Education, vol. 70,* pp. 29–40.

Milton, J. (2009). *Measuring second language vocabulary acquisition*. Multilingual Matters.

Molnar, A. R. (1990). Computers in education: A historical perspective of the unfinished task. *T.H.E. Journal, 18*(4), 80–83.

Mousavi, S. A. (2002). *An encyclopaedic dictionary of language testing* (3rd ed.). Taiwan: Tung Hua Book Company.

Nagy, W. (1997). On the role of context in first and second language vocabulary learning. In N. Schmitt and M. McCarthy (eds) *Vocabulary: Description, Acquisition and Pedagogy* (pp 64-83). Cambridge: Cambridge University Press.

Naismith, L., & Corlett, D. (2006). *Reflections on success: A retrospective of the mLearn conference series 2002-2005.* In mLearn 2006: Across generations and cultures (pp. 29-pages).

Nassaji, H. (2004). The relationship between depth of vocabulary knowledge and L2 learners' lexical inferencing strategy use and success. *Canadian Modern Language Review,* 61, 107–134.

Nation, I. P. (1982). Beginning to learn foreign vocabulary: A review of the research. *RELC journal*, 13(1), 14-36.

Nation, I. S. P. (1990). *Teaching and Learning Vocabulary*. Newbury House, New York.

Nation, I. S. P. (2001). *Learning Vocabulary in Another Language*. Cambridge: Cambridge University Press.

Nattinger, J. R., & Decarrico, J. S. (1992). *Lexical phrases and language teaching*. Oxford England: Oxford University Press.

Negroponte, N. (1995). *Being digital.* New York: Vintage Books.

Newton, J. (1995). Task-based interaction and incidental vocabulary learning: A case study. *Second Language Research*, 11, 159–177.

Nonis, D. (2005). *3D virtual learning environments (3D VLE).* Ministry of Education, Singapore.

O'Connor, T. (Feb. 21, 1997). *Using Learning Styles to Adapt Technology for Higher Education.* Indiana State University Center for Teaching and Learning, http://web.indstate.edu/ctl/ styles/learning.html.

O'Donnell A. (February 1, 2018). *Tips for creating a Virtual Reality room*. Retrieved: May 27, 2018. https://www.lifewire.com/create-a-virtual-reality-room-4121179

Oller, J. W. (1979). *Language tests at school. A pragmatic approach*. London: Longman.

O'Malley, M.J. and Chamot, A.U. (1996). *Learning Strategies in Second Language Acquisition.* Cambridge: Cambridge Applied Linguistics.

Optical head-mounted display: (2013). *http://en.wikipedia.org/wiki/Optical_headmounted_display*.

Ota, D., Loftin, B., Saito, T., Lea, R., Keller, J. (1995). Virtual reality in surgical education. *Computers in Biology and Medicine, vol. 25*(2). 127–137.

Oxford, R. (1990). *Language Learning Strategies. What Every Teacher Should Know*. Boston: Heinle & Heinle.

Oxford, R., & Crookall, D. (1990). Vocabulary learning: A critical analysis of techniques. *TESL Canada Journal*, 7, 9-29.

Oxford, R. L., & Scarcella, R. C. (1994). Second language vocabulary learning among adults: State of the art in vocabulary instruction. *System, 22*(2).

Palloff, R. M., & Pratt, K. (2003). *The virtual student: A profile and guide to working with online learners.* John Wiley & Sons.

Palmberg, R. (1987). Patterns of vocabulary development in foreign-language learners. *Studies in Second Language Acquisition, 9,* 201–219.

Pan, Z., Cheok, A. D., Yang, H., Zhu, J., & Shi, J. (2006). Virtual reality and mixed reality for virtual learning environments. *Computers & Graphics, 30*(1), 2028.

Paribakht, T., and Wesche, M. (1993). Reading comprehension and second language development in a comprehension-based ESL program. *TESL Canada Journal, 11*, 9–29.

Pedersen, I. (2014). Are Wearables Really Ready to Wear? *IEEE Technology and Society Magazine. 33, 2,* 16–18.

Pedersen, I. and Trueman, D. (2013). "Sergey Brin is Batman ": Google ' s Project Glass & the Instigation of Computer Adoption in Popular Culture. *CHI EA '13: CHI '13 Extended Abstracts on Human Factors in Computing Systems,* 2089–2097.

Piaget, J., & Inhelder, B. (1971). The child's conception of space (F.J. Langdon & J.L. Lunzer, trans.). London : Routledge and Kegan Paul.

Pierce, D. (2015, March 6*). The Future of Virtual Reality is inside your smartphone, Wired.* Retrieved from http://www.wired.com/2015/03/future-virtual-reality-inside-smartphone/

Pink, D. H. (2006). *A whole new mind: Why right-brainers will rule the future*. Penguin.

Pratt, D. R., Zyda, M., & Kelleher, K. (1995). Virtual reality: in the mind of the beholder. *IEEE Computer Society, 28*(7), 17-19.

Pungburn, D. J. (2016, 29 April). *Peek Inside Second Life's Virtual Reality Successor, 'Project Sansar'* . Retrieved: 17 May 2018, https://creators.vice.com/en_us/article/jpv9ab/second-life-vr- sequel-concept-art-project-sansar

Purpura, J. E. (1999). *Learner strategy use and performance on language tests: A structural equation modelling approach*. Cambridge University Press.

Qian, D. (1999). Assessing the roles of depth and breadth of vocabulary knowledge in reading comprehension. *Canadian Modern Language Review, 56*, 282–308.

Quinn, F., Keogh, P., McDonald, A., & Hussey, D. (2003). A study comparing the effectiveness of conventional training and virtual reality simulation in the skills acquisition of junior dental students. *European Journal of Dental Education, 7(4),* 164-169.

Read, J. (2000). *Assessing vocabulary*. Cambridge: Cambridge University Press.

Regan, C. (1995). An investigation into nausea and other side-effects of head-coupled immersive virtual reality. *Virtual Reality, 1*(1), 17-31.

Revington, S. (2013). *Authentic learning.* Retrieval: 2018, 18 May, http://authenticlearning.weebly. com.

Richards, J. C., & Renandya, W. A. (Eds.). (2002). *Methodology in language teaching: An anthology of current practice.* Cambridge University Press.

Rheingold, H. (1991). Virtual reality: *The revolutionary technology of computer generated artificial worlds.* New York: Simon & Schuster Publishing.

Richards, J. & Rodgers, T. S. (1986). *Approaches and methods in language teaching*: *A description and analysis.* New York: Cambridge University Press.

Rieber, L. (1996). Seriously considering play: Designing interactive learning environments based on the blending of microworlds, simulations, and games. *Educational Technology Research and Development, 44*(2), 43-58.

Ringbom, H. (1987). *The Role of the First Language in Foreign Language Learning.* Philadelphia: Multilingual Matters Ltd.

Riva, G. (2003). Applications of virtual environments in medicine. *Methods of Information in Medicine, 42,* 524-534.

Riva, G. (2006). *Virtual reality, Encyclopaedia of Biomedical Engineering*. London: John Wiley & Sons.

Rivers, W. (1981). *Teaching Foreign Language Skills.* Chicago, London: The University of Chicago Press.

Rivers, W. (1983). *Communicating naturally in a second language. Theory and practice in language teaching.* New York: Cambridge University Press.

Roggen, D., Perez, D.G., Fukumoto, M. and van Laerhoven, K. (2014). *ISWC 2013-Wearables Are Here to Stay. IEEE Pervasive Computing. 13, 1,* 14–18.

Rose, H., & Billinghurst, M. (1995). Zengo Sayu: *An immersive educational environment for learning Japanese* (Technical Report 4-95). Seattle: Human Interface Technology Laboratory, University of Washington.

Rosemblum, L. J., & Cross, R. A. (1997). *The challenge of virtual reality.* In W. R. Earnshaw, J. Vince, & H. Jones (Eds.), Visualization & Modeling (pp. 325–399). San Diego, CA: Academic Press.

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

Roussou, M. (2004, June). *Examining young learners' activity within interactive virtual environments.* In Proceedings of the 2004 conference on Interaction design and children: building a community (pp. 167-168). ACM.

Roussou, M. (2004). Learning by doing and learning through play: An exploration of interactivity in virtual environments for children. *Computers in Entertainment, 2*(1), 10-23.

Rubin, J. (1987). Learner strategies: Theoretical assumptions, research history and typology. *Learner strategies in language learning*, 15-30.

Salzman, M. C., & Loftin, R. B. (1996). *ScienceSpace: Lessons for designing immersive virtual realities.* Paper presented at the CHI 96, Vancouver, Canada.

Salzman, M. C., Dede, C., Loftin, R. B., & Chen, J. (1999). A model for understanding how virtual reality aids complex conceptual learning. Presence: *Teleoperators and Virtual Environments, 8*(3), 293-316.

Sanchez, A., Barreiro, J. M., & Maojo, V. (2000). Design of virtual reality systems for education: a cognitive approach. *Education and Information Technologies, 5*, 345-362.

Schmitt, N., and Meara, P. (1997). Researching vocabulary through a word knowledge framework: word associations and verbal suffixes. *Studies in Second Language Acquisition, 19,* 17–36.

Schmitt, N. (2000). *Vocabulary in Language teaching.* Cambridge: Cambridge Language Education.

Schouten-Van Parreren, C. (1989). Vocabulary learning through reading: Which conditions should be met when presenting words in texts. *AILA review*, 6(1), 75-85.

Schroeder, C. (Sept.-Oct. 1993). "New Students—New Learning Styles." Change. [http://www.virtualschool.edu/mon/Academia/KierseyLearningStyles.html].

Scrivener, J. 2OO5. *Learning Teaching: The Essential Guide to English Language Teaching.* Macmillan Publishers Limited.

Seal, B. (1991). Vocabulary learning and teaching. In M. Celce-Murcia (ed.) *Teaching English as a Foreign or Second Language* (2nd edn) (pp. 296-312). New York: Newbury House.

Selwood, I., Mikropoulos, T., & Whitelock, D. (2000). Guest editorial. *Education and Information Technologies, 5(4),* 233-236.

Sherman, W. R., & Craig, A. B. (2003). Understanding virtual reality. *Interface, application and design.* Boston, MA: Morgan-Kaufmann Publishers.

Shekan, P. (1988). State of the art: Language testing. (Part I). *Language Teaching*, 21, 211-221.

Shekan, P. (1989). State of the art: Language testing. (Part II). *Language Teaching*, 22, 1-13.

Shim, K. C., Park, J. S., Kim, H. S., Kim, J. H., Park, Y. C. and Ryu, H. I. (2003) Application of virtual reality technology in biology education. *Journal of Biological Education, vol. 37*(2), 71–74.

Skehan, P. (2000). *A Cognitive Approach to Language Learning.* Oxford: Oxford University Press.

Singhal, S., & Zyda, M. (1999). Networked Virtual Environments: Design and implementation. NY: ACM Press.

Slater, M., & Usoh, M. (1993). Presence in immersive virtual environments. *Paper presented at IEEE Virtual Reality International Symposium.*

Song, K. S., & Lee, W. Y. (2002). A virtual reality application for geometry classes. *Journal of Computer Assisted Learning, 18,* 149-156.

Sökmen, A. J. (1997). Current trends in teaching second language vocabulary. Readings in Methodology, 152. In N. Schmitt, and M. McCarthy (eds). *Vocabulary: Description, Acquisition and Pedagogy* (pp.237-257). Cambridge: Cambridge University Press.

Stahl, S.A. (1985). To teach a word well: A framework for vocabulary instruction. *Reading World,* 24(3), 16-27.

Stahl, S. A. (1986). Three principles of effective vocabulary instruction. *Journal of Reading,* 29, 662-668.

Stahl, S. A. & Fairbanks, M. M. (1986). The effects of vocabulary instruction: A model-based meta-analysis. *Review of educational Reseach, 56*(1), 72-110.

Standen, P. J., & Brown, D. J. (2005). Virtual reality in the rehabilitation of people with intellectual disabilities: review. *Cyberpsychology & behavior, 8(3),* 272-282.

Starner, T. 2013. Project Glass: An Extension of the Self. *IEEE Pervasive Computing. 12*, *2*, 14–16.

Steuer, J. (1992). Defining virtual reality: Dimensions determining telepresence, *Journal of communication, vol. 42*(4), pp. 73–93.

Sternberg, R. J. (1998). *The triarchic mind: A new theory of human intelligence*. New York, NY: Viking Press.

Sternberg, R. J. (1997). *Thinking styles*. Cambridge, MA: Cambridge University Press.

Strangman, N., & Hall, T. (2003). *Virtual reality/simulations*. Wakefield, MA: National Center on Accessing the General Curriculum. Retrieved May 9, 2006, from http://www.cast.org/publications/ncac/ncac_vr.html

Tao, L. and Zhang, M. (2013). Understanding an Online Classroom System Design and Implementation Based on a Model Blending Pedagogy and HCI. *IEEE Transactions on Human-Machine Systems. 43*(5), 465–478.

Takač, V. P. (2008). *Vocabulary learning strategies and foreign language acquisition* (Vol. 27). Multilingual Matters.

Terrell, T.D. (1986). Acquisition in the Natural Approach: The binding/access framework. *Modern Language Journal, 70*(3), 213-227.

Thomas, B.H. (2012). Have We Achieved the Ultimate Wearable Computer? *2012 16th International Symposium on Wearable Computers*, 104–107.

Thornbury, S. (2002). *How to Teach Vocabulary*. Harlow: Longman.

Vallurupalli, S., Paydak, H., Agarwal, S.K., Agrawal, M. and Assad-Kottner, C. (2013). Wearable technology to improve education and patient outcomes in a cardiology fellowship program - a feasibility study. *Health and Technology. 3, 4,* 267–270.

Virtual reality. (n. d.). Retrieved from https://en.wikipedia.org/wiki/Virtual_reality

Virtual reality. (n. d.). Retrieved from http://www.merriamwebster.com/dictionary/ Virtualreality

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

Wan, Z., Fang, Y., & Neufeld, D. J. (2007). The role of information technology in technology-mediated learning: A review of the past for the future. *Journal of Information Systems Education, 18*(2), 183 - 192.

Warburton, S. (2010). Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching. *British Journal of Educational Technology, 40(*3), 414-426.

Watson, D. (2000). Editorial. Education and Information Technologies, 5(4), 231-232.

Weir, C. J. (2005). *Language testing and validation: An evidence-based approach*. Basingstoke, England: Palgrave Macmillan.

Wesche, M., and Paribakht, S. (1999b). Introduction. *Studies in Second Language Acquisition, 21,* 175–180.

West, M. (1930). Speaking-vocabulary in a foreign language. *The Modern Language Journal*, *14*(7), 509-521.

Wetzel, C. D., Radtke, P. H., & Stern, H. W. (1994). *Instructional effectiveness of video media*. Lawrence Erlbaum Associates, Inc.

White, J. (1998). *Do Howard Gardner's multiple intelligences add up?* London: University of London Institute of Education.

Widdowson, H. G. (1978). *Teaching language as communication*. Oxford. Oxford University Press.

Williams, M. and Burden, R.L. (2001). *Psychology for language teachers.* Cambridge: Cambridge University Press.

Williams-Bell, F. M., Kapralos, B., Hogue, A., Murphy, B. M., & Weckman, E. J. (2015). Using serious games and virtual simulation for training in the fire service: a review. *Fire Technology*, 51(3), 553-584.

Willis, J. (1990). *Journalism: state of the art*. New York: Praeger.

Winn, W. (1993). A Conceptual Basis for Educational Applications of Virtual Reality.Technical Report TR-93-9, Human Interface Technology Laboratory - University of Washington.

Winn, W., Hoffman, H., Hollander, A., Osberg, K., Rose, H., & Char, P. (1997, March). *The effect of student construction of virtual environments on the performance of high- and low-ability students.* Paper presented at the meeting of the American Educational Research Association, Chicago, IL.

Wong, B. L. W., Ng, B. P, & Clark, S. A. (2000). Assessing the effectiveness of animation and virtual reality in teaching operative dentistry. *Journal of Dentistry: Educational Technology Section.* Retrieved May 24, 204, fromhttp://www1.elsevier.com/homepages/sab/jdentet/contents/wong2/wong2.html

Wong, M. S. L. (2005). Language learning strategies and language self-efficacy: Investigating the relationship in Malaysia. *RELC journal*, 36(3), 245-269.

Wu, F., Liu, Z., Wang, J., & Zhao, Y. (2015, March). *Establishment virtual maintenance environment based on VIRTOOLS to effectively enhance the sense of immersion of teaching equipment.* Proceedings of the 2015 International Conference on Education Technology, Management and Humanities Science (ETMHS 2015). Atlantis Press. doi:10.2991/etmhs-15.2015.93

Yalın, H. Ġ. (2007). *Öğretim Teknolojileri Ve Materyal Geliştirme*, Ankara: Nobel Yayın Dağıtım.

Yang, K.-Y., & Heh, J.-S. (2007). The impact of internet virtual physics laboratory instruction on the achievement in physics, science process skills and computer attitudes of 10th-grade students. Journal of Science Education and Technology, 16(5), 451-461.

[1] Retrieved: 2018, 27 May https://kotaku.com/hands-on-with-project-sansar-the-new-second-life-1796312409

[2] Retrieved: 2018, 27 May https://www.google.com.tr/search?q=google+cardboard&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjOktX7qKHbAhWEI1AKHXFHBA8Q_AUICygC&biw=1517&bih=735

[3] Retrieved: 2018, 27 May, https://www.google.com/search?q=htc+vive&source

[4] Retrieved: 2018, 27 May https://www.google.com/search?biw=1242&bih=592&tbm=isch&sa=1&ei=rowGW7TYOKi26ATFjKW4Dg&q=oculus+rift&oq=oculus+rift&gs_l=img.3.

[5] Retrieved: Retrieved: 2018, 27 May https://www.google.com/search?biw=1242&bih=592&tbm=isch&sa=1&ei=dIwGW7m0DMSg6ATQoquoDA&q=samsung+galaxy+vr&oq=samsung+galaxy+vr&gs_l=img.3.

[6] Retrieved: 2018, 27 May https://webrazzi.com/2017/07/19/google-glass-geri-dondu/

[7] Retrieved: 2018, 27 May, http://www.sanalgozluk.com/SpaceWalker-VR-Sanal-Gerceklik-Yurume- Simulatoru,PR-222.html

[8] Adapted: August 2016, 'VR Market Review for the BBC', Tim Fiennes, BBC Marketing and Audiences.

## APPENDIX 1

## COURSE PROGRAM

| | Language Use | Vocabulary items | Objectives | VR Application | Hours |
|---|---|---|---|---|---|
| **Week 1** | INRODUCTION<br>PRE-TEST | | | | 2 |
| **Week 2** | There is<br>There are | *Furniture in a house:*<br>Dining room/Kitchen: drawer, microwave, cupboard, stove, calendar, clock, table, chair - Living room: sofa, picture, curtain, cushion, tv - Bedroom: bed, wardrobe, clock, pillow -Bathroom: washing machine, towel, shower, wash powder, washbowl -<br>Toilet: toilet paper, mat<br>*Prepositions of place:* in, on, under, next to, behind, in front of, between | To identify furniture in a house.<br>To describe a house/room using prepositions of place. | Apartment View VR tour | 2 |
| **Week 3** | There is<br>There are | Furniture in a house:<br>Dining room/Kitchen: drawer, microwave, cupboard, stove, calendar, clock, table, chair - Living room: sofa, picture, curtain, cushion, tv - Bedroom: bed, wardrobe, clock, pillow -Bathroom: washing machine, towel, shower, wash powder, washbowl -<br>Toilet: toilet paper, mat<br>Prepositions of place: in, on, under, next to, behind, in front of, between | To identify furniture in a house.<br>To describe a house/room using prepositions of place. | Apartment View VR tour | 2 |
| **Week 4** | There is<br>There are | *Household good, food and drinks*: bottle, toilet paper, washing powder, cookie, apple, chocolate, toothpaste, juice, fizzy drink, meat<br>*(Un)Countable words:* many, much, some, a lot of, any, a few.<br>*Containers*: jar, roll, box, packet, bag, bar, tube, carton, can, tray | To name household goods.<br>To talk about quantities & containers. | VR Grocery | 2 |
| **Week 5** | There is<br>There are | Household good, food and drinks: bottle, toilet paper, washing powder, cookie, apple, chocolate, toothpaste, juice, fizzy drink, meat<br>(Un)Countable words: many, much, some, a lot of, any, a few.<br>Containers: jar, roll, box, packet, bag, bar, tube, carton, can, tray | To name household goods.<br>To talk about quantities & containers. | VR Grocery | 2 |
| **Week 6** | Bears hibernate.<br>The zebras are running.<br>The deer is jumping. | *Animals:* elephant, bear, crocodile, stag, dinosaur, zebra, eagle<br>*Verbs:* fly, run, walk, swim, fight, jump, hibernate, have antlers/stripes, became extinct, laugh, see up to 2 miles. | To name animals.<br>To describe animal action. | VR Roller Tour Forest | 2 |
| **Week 7** | Bears hibernate.<br>The zebras are running.<br>The deer is jumping. | Animals: elephant, bear, crocodile, stag, dinosaur, zebra, eagle<br>Verbs: fly, run, walk, swim, fight, jump, hibernate, have antlers/stripes, became extinct, laugh, see up to 2 miles. | To name animals.<br>To describe animal action. | VR Roller Tour Forest | 2 |
| **Week 8** | Revision | | | | 2 |
| **Week 9** | MATERIAL MOTIVATION QUESTIONNAIRE<br>POST-TEST<br>(four-week interval) | | | | 2 |
| **Week 14** | FOLLOW-UP TEST | | | | 2 |

## APPENDIX 2

### Öğretim Materyalleri Motivasyon Anketi (ÖMMA)

Sevgili öğrenciler,

Bu anket derslerde kullanılan öğretim materyallerinin derse karşı olan motivasyonu nasıl etkilediğini ölçmeyi hedefleyen 24 maddeden oluşmuştur. Anketi cevaplarken, lütfen her bir ifadenin, karşısında yer alan **Tamamen Katılıyorum (⑤), Çok Katılıyorum (④),Orta Derecede Katılıyorum (③), Az Katılıyorum (②), Hiç Katılmıyorum (①)** seçeneklerinden size en uygun olanını işaretleyiniz. Unutmayınız ki bu bir sınav değildir ve sonuçta sizlere derslerinizi etkileyebilecek herhangi bir puan ya da not verilmeyecektir. Bu sebeple sizden soruları içtenlikle ve samimi bir şekilde cevaplamanız beklenmektedir. *Olmasını istediğiniz ya da başkalarının sizden duymayı istediği cevabı vermeyiniz*. Lütfen hiçbir soruyu cevapsız bırakmayınız. İlginiz ve katkılarınız için teşekkür ederim.

**Uyarı:** Bu ankette kullanılan "derste kullanılan materyaller" ifadesi ders içinde ve dışında öğrenciler tarafından kullanılması önerilen kitap, makale, sunu, web sayfası vb. her türlü derse yardımcı kaynakları ifade etmektedir.

| | | Tamamen Katılıyorum | Çok Katılıyorum | Orta Derecede Katılıyorum | Az Katılıyorum | Hiç Katılmıyorum |
|---|---|---|---|---|---|---|
| 1 | İçeriğini ilk öğrendiğimde, bu derste dikkatimi çeken ilginç bazı şeylerin olduğunu gördüm. | ⑤ | ④ | ③ | ② | ① |
| 2 | Dersin işleniş şekli ve derste kullanılan materyaller dikkat çekiciydi. | ⑤ | ④ | ③ | ② | ① |
| 3 | Derste kullanılan materyallerde yeterli bilgi yoktu. | ⑤ | ④ | ③ | ② | ① |
| 4 | Derste kullanılan materyallerde bilgilerin işleniş şekli dikkat çekiciydi. | ⑤ | ④ | ③ | ② | ① |
| 5 | Bu derste dikkat çekici şeyler vardı. | ⑤ | ④ | ③ | ② | ① |
| 6 | Derste bazı dikkat çekici yeni bilgiler öğrendim. | ⑤ | ④ | ③ | ② | ① |
| 7 | Alıştırmaların, materyallerin, sunumların çeşitliliği dikkatimi derse vermeme yardımcı oldu. | ⑤ | ④ | ③ | ② | ① |
| 8 | Derste kullanılan materyallerde işlenen konunun önemini gösteren hikâyeler, resimler ve örnekler vardı. | ⑤ | ④ | ③ | ② | ① |
| 9 | Derste kullanılan materyaller benim için uygundu. | ⑤ | ④ | ③ | ② | ① |
| 10 | Derste öğrendiğimiz bilgilerin nasıl uygulamaya yansıtılabileceğine dair açıklama ve örnekler vardı. | ⑤ | ④ | ③ | ② | ① |
| 11 | Derste kullanılan materyallerin gerek içeriği gerek sunumu konularının öğrenilmeye değer olduğu izlenimini uyandırıyor. | ⑤ | ④ | ③ | ② | ① |
| 12 | Dersi anlamak beklediğimden daha zor oldu. | ⑤ | ④ | ③ | ② | ① |
| 13 | İçeriğini ilk incelediğimde, bu ders kapsamında neler öğreneceğimi anladım. | ⑤ | ④ | ③ | ② | ① |
| 14 | Derste kullanılan materyallerde çok fazla bilgi verildiğinden nelerin önemli olduğunu ayırt edemedim. | ⑤ | ④ | ③ | ② | ① |
| 15 | Verilen ödevleri yaptıkça konuları öğrenebileceğime dair kendime güvenim arttı. | ⑤ | ④ | ③ | ② | ① |
| 16 | Dersteki alıştırma ve uygulamalar oldukça zordu. | ⑤ | ④ | ③ | ② | ① |
| 17 | Ders konularını çalıştıktan sonra, bu dersten geçebileceğime dair güvenim arttı. | ⑤ | ④ | ③ | ② | ① |
| 18 | Ders kapsamındaki konuların birçoğunu tam olarak anlayamadım. | ⑤ | ④ | ③ | ② | ① |
| 19 | Dersteki konu diziliminin iyi olması dersi öğrenebileceğime dair güvenimi artırdı. | ⑤ | ④ | ③ | ② | ① |
| 20 | Dersteki uygulamaları/alıştırmaları tamamlamak bende başarı hissi uyandırdı. | ⑤ | ④ | ③ | ② | ① |
| 21 | Dersten zevk aldığım için, dersteki konular hakkında daha çok şey öğrenmek istiyorum. | ⑤ | ④ | ③ | ② | ① |
| 22 | Derse zevk alarak çalıştım. | ⑤ | ④ | ③ | ② | ① |
| 23 | Ödev sonrasındaki dönütler ve dersteki diğer yorumlar emeğimin karşılığını aldığım hissini verdi. | ⑤ | ④ | ③ | ② | ① |
| 24 | Dersi başarıyla tamamlamaktan mutluluk duydum. | ⑤ | ④ | ③ | ② | ① |

**APPENDIX 3**

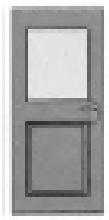
NAME/SURNAME: _____ MARK:

PRE-TEST

PART 1

Look and read. Choose the correct words and write them on the lines.
There is one extra word.

cupboard



door

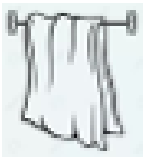
bed

clock

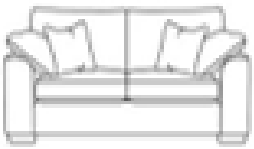
table

stove

wardrobe



towel



sofa

washing machine

Ex: You wash your dirty clothes in it. _____*washing machine*_____

1. You sleep on it. It's in the bedroom. _____

2. You put glasses, cups and plates in it. _____

3. You cook food on it. _____

4. You sit on it and watch TV. It's in the living room. _____

5. You put your clothes in it. It's in the bedroom. _____

6. You look at it and learn the time. _____

7. You dry your hands and face with it. _____

8. You open this when you go in and out of the room. _____

PART 2

Look at the picture. Circle "True" or "False".

1. There is a picture in the bedroom. TRUE FALSE

2. There are curtains in the living room. TRUE FALSE

3. There is a microwave in the kitchen. TRUE FALSE

4. There are drawers in the kitchen. TRUE FALSE

5. There is a TV in the living room. TRUE FALSE

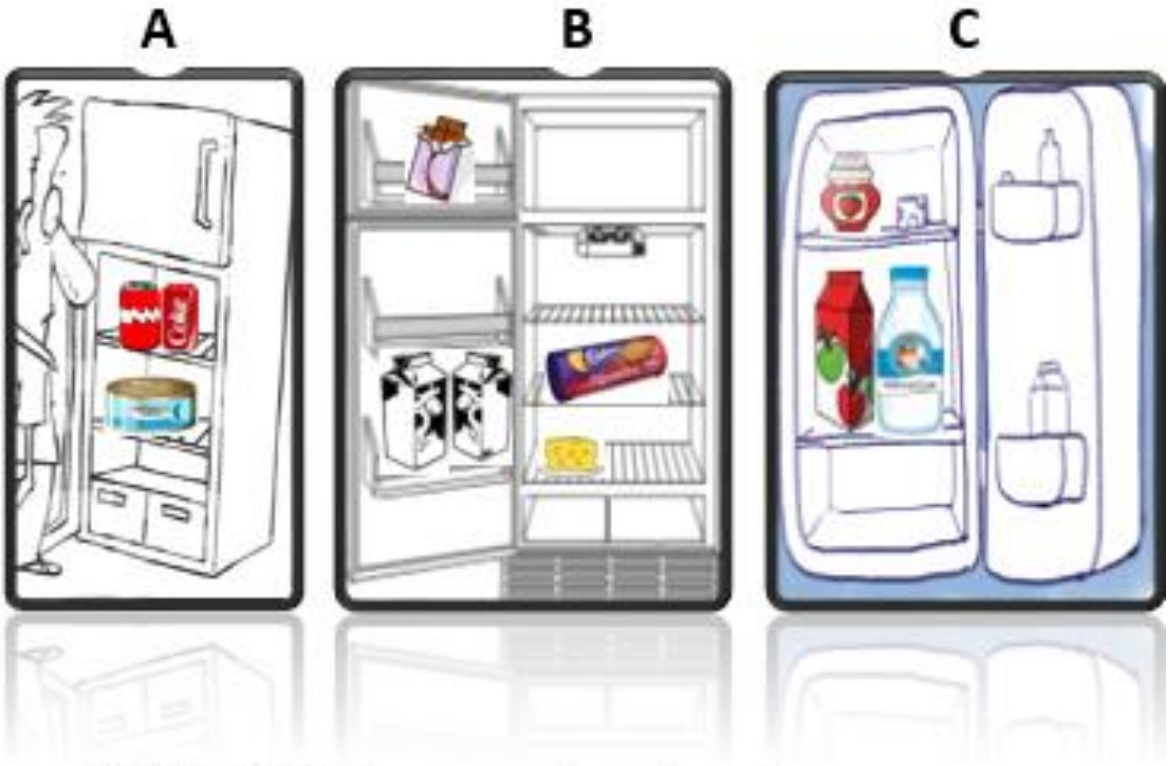
6. There is a calendar in the bedroom. TRUE FALSE

7. There is a mat in the bathroom. TRUE FALSE

8. There is an armchair in the bedroom. TRUE FALSE

PART 3

Look at the pictures. Choose A, B, or C.




| | | | |
|---|---|---|---|
| 1) There is a can of fish. | A | B | C |
| 2) There is a jar of jam. | A | B | C |
| 3) There are two cans of fizzy drink. | A | B | C |
| 4) There are two cartons of milk. | A | B | C |
| 5) There is a carton of juice. | A | B | C |
| 6) There is a packet of cookie. | A | B | C |
| 7) There is a bottle of milk. | A | B | C |
| 8) There is a bar of chocolate. | A | B | C |

PART 4

Look at the picture. Read and circle a, b, or c.

a

In my trolley, there is a packet of cookies, a can of fish, a bar of chocolate, a carton of milk and a carton of juice.

b

In my trolley, there is a box of washing powder, a jar of strawberry jam, a carton of cookie, and a bottle of milk.

c

In my trolley, there is a bar of chocolate, a carton of milk, a can of fizzy drink, and a bottle of water.

## PART 5

**Read the text. Choose the right words and write them on the lines.**

### Zoos

deer – elephants – dinosaur – zebra – bear – crocodiles – eagles

I'm at the zoo now. My favourite animal is  1) _____.

I like  2) _____, too. A big, brown  3) _____

is walking around. There are some  4) _____. They are running.

There are dangerous  5) _____. They are swimming in

the river. The  6) _____ are flying in the sky. I want to see a

 7) _____, but they don't live anymore.

## PART 6

**Look at the picture. Then circle the right answer.**

1 They are ...

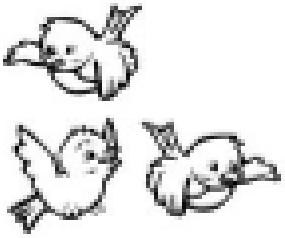
a) watching c) sleeping

b) fighting d) eating

2 It is ...

a) running c) flying

b) climbing d) having



3 They are ...

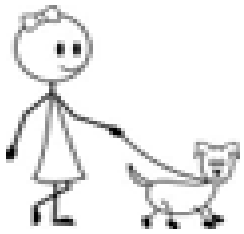
a) drinking c) sitting

b) listening d) flying

4 It is ...

a) jumping c) flying

b) drawing d) cooking



5 They are ...

a) swimming c) riding

b) walking d) reading

6 It is ...

a) walking c) flying

b) going d) swimming

## PART 7

**Look at the picture and write the words.**


1 *window* 3 _____ 4 _____

6 _____ 7 _____ 9 _____

10 _____ 12 _____

**Read and draw lines.**

This is my bedroom. There is a computer on the table. There is a clock between the window and the picture. There is a calendar next to the window behind the door. There is a chair behind the door. There are cushions under the bed. There are speakers in front of the door.

## PART 8

**Complete the sentences as in the example.**



It's _____

the _____


It's _____

the _____


It's _____

the _____

It's _____

the _____

## PART 9

**Match the words in the boxes with photos 1-10.**

| | |
|---|---|
| bottle roll carton<br>~~can~~ tube box jar<br>packet bag bar | juice toothpaste ~~fizzy drink~~<br>toilet paper coffee chocolate<br>washing powder crisps<br>apples shampoo |


1. *can of fizzy drink*
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

## PART 10

Complete the sentences with the phareses in the box.

*have the strongest bite *have antlers

*became extinct *have unique stripes *laugh

*see up to 2 miles ~~*hibernate~~

1. Bears _____*hibernate*_____.
2. Stags _____.
3. Elephants _____.
4. Zebras _____.
5. Alligators _____.
6. Eagles _____.

## PART 11

Label the photos with the words in the box.

pollute burn destroy throw away
bury recycle

destroy

1 _____

2 _____

3 _____

4 _____

5 _____

## PART 12

**Complete the text using the verbs in the box.**

| | | |
|---|---|---|
| pollutes | ~~throw away~~ | recycle |
| burn | reuse | bury |

Don't ***throw away*** plastic bottles and bags. You should 1)_____ them. Also, you shouldn't 2)_____ the rubbish because the smoke 3)_____ the atmosphere. It isn't a good idea to 4)_____ plastic bags in the ground. When you get a plastic bag, don't put it in the bin! You should 5)_____ it several times.

**Choose the correct words.**

0) How much /(many)/ any plastic bags do you use?

2) There are any / a lot of / much bottles to recycle.

3) We have some / many / much potatoes in the cupboard but we need more for dinner.

4) I have some / any / many chocolate in my bag.

5) There isn't any / many / some shampoo. We should buy

**APPENDIX 4**

NAME/SURNAME: _____ MARK:

## POST-TEST

**A) Answer the questions according to the picture below.**

dining room

bedroom

bathroom

living room

kitchen

**I- Complete the sentences with the words in the box.**

**Ex.** In the ___bedroom___ there is a picture.

1. In the _____ there is a mat.
2. In the _____ there are pillows.
3. In the _____ there is a sofa.
4. In the _____ there is a clock.
5. In the _____ there is an oven.
6. In the _____ there is a shower.
7. In the _____ there is a wash basin.

**II- Write the names of the objects.**

Ex. 1 ___curtain___ 3 _____ 5 _____

4 _____ 6 _____ 6 _____

7 _____ 8 _____

B) Look at the picture. Complete with "between, behind, in front of, opposite, under, on".

Ex. *There is a sofa* __*in front of*__ *the pictures.*

1. There are cushions _____ the sofa.
2. There are pictures _____ the sofa.
3. There is a table _____ the sofa.
4. There is a clock _____ the chair.
5. There is a sofa _____ the cupboard and chair.
6. There is a cupboard _____ the sofa.

C) Read and circle.

**MY SHOPPING LIST**

- A carton of juice ✓
- A jar of coffee
- A tube of toothpaste
- A bottle of water
- A can of fizzy drink
- A bag of apples
- A packet of cookies
- A box of washing powder

D) Complete the sentences with "many, a lot of, much, any, a little,".

Ex  There are _*a lot of*_ rolls of toilet paper.

1  There isn't _____ toothpaste.

2  There aren't _____ eggs.

3  There is _____ juice.

4  There is _____ meat.

5  There isn't _____ meat.

**E) Complete the sentences with the words in the box.**

| can | bar | carton | roll | tube | bag |
|---|---|---|---|---|---|

1 Do you eat a lot of sweets?
Not really. I have a small _____ of chocolate every week.
2 How many things did you get in the shop?
We only bought a _____ of toothpaste!
3 You don't drink much water with your food.
But I always have a _____ of fizzy drink.
4 Do you want any fruit today?
Yes, I'd like a _____ of apples, please.
5 We need to do some shopping.
Yes, I mustn't forget to get a _____ of toilet paper.
6 Are you thirsty?
Yes. Can I have a _____ of orange juice, please?

**F) Complete the sentences with the words in the box.**

| toothpaste | fish | juice | toilet paper |
|---|---|---|---|
| washing powder | shampoo | chocolate | |

Are you thirsty? Would you like this carton of _____juice_____?

1 I want to wash my hair, but I can't find that bottle of _____
2 Can we open the big bar of _____?
We're hungry.
3 This can of _____ is very cheap.
4 Where's my tube of _____? I can't see it in the bathroom.
5 We need to buy some more rolls of _____. We haven't got any!
6 My T-shirt is very dirty. Have we got a new box of _____?

**G) Circle the right answer according to the picture.**

1

a) Don't bury plastic.
b) Don't throw away plastic.
c) Don't burn plastic.
d) Don't buy plastic.

2

a) Don't throw away.
b) Burn.
c) Bury.
d) Don't recycle.

3

a) Don't buy a lot of plastic.
b) Recycle.
c) Don't bury.
d) Destroy.

4

a) Reuse.
b) Don't destroy.
c) Don't bury.
d) Recycle.

**H) Write the name of the animals.**

| dinosaur | elephant | zebra | stag | bear | eagle |
|---|---|---|---|---|---|






Ex: *elephant* 1 _____ 2 _____ 3 _____ 4 _____ 5 _____

**I) Read and write the name of the animal.**

Ex: They see up to 2 miles. *eagles*

1. They hibernate. _____
2. They smile. _____
3. They have got antlers. _____
4. They became extinct. _____
5. They have unique stripes. _____

**J) Look at the pictures. Complete the sentences with the words in the box.**

1 
2 

| flying - ~~jumping~~ - running - swimming - fighting - walking |
|---|

3 
4 
5 
6 

Ex. It's *jumping*

1. They're _____
2. It's _____
3. It's _____
4. It's _____
5. It's _____

**APPENDIX 5**

**PART 1**

Look at the picture. Choose the right answer.

This is my 0) _____. It's small. There's a bedroom, a living room, a kitchen and a 1) _____. There are windows in the 2) _____. There are two 3) _____ and also two 4) _____ in the bathroom. In the living room, there's a small 5) _____ in front of the sofa. In the bedroom, there's a 6) _____ opposite the bed and there's a computer 7) _____ the table. In the kitchen, there's a microwave 8) _____ the cupboards.

| | | | | |
|---|---|---|---|---|
| 0) | house | school | apartment | office |
| 1) | hall | bathroom | dining room | study |
| 2) | bathroom | kitchen | living room | bedroom |
| 3) | wash basins | chairs | clocks | wash bowls |
| 4) | mats | drawers | towels | pictures |
| 5) | armchair | table | chair | cupboard |
| 6) | clock | calendar | picture | TV |
| 7) | in | on | under | between |
| 8) | opposite | under | between | next to |

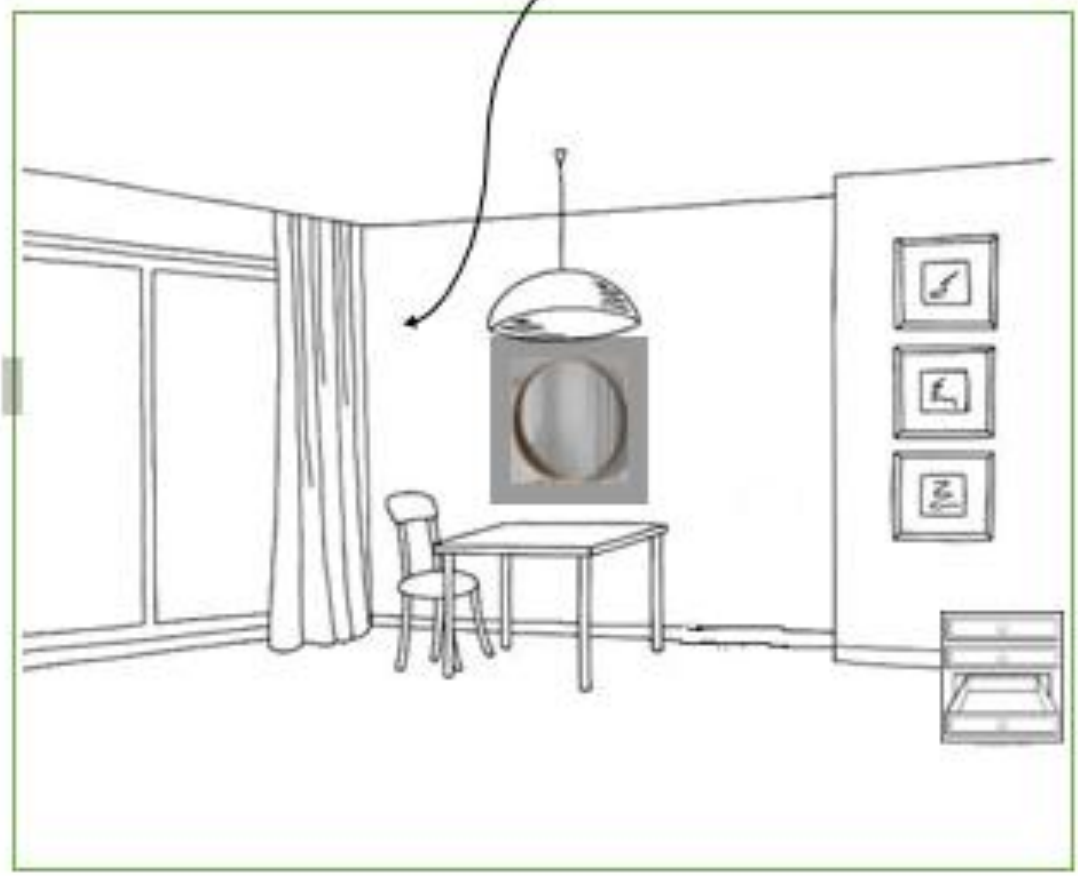
**Read and match.**

Ex: There's a clock on the wall next to the curtain.

There's a sofa opposite the table. There's a mat in front of the drawer. There's a speaker in the drawer. There's a cushion under the table. There's a computer in front of the window. There's a wash bowl behind the chair. There's a cupboard next to the drawers.










Write 5 sentences about the picture as in the example.

Ex: There are curtains on the window.

1. _____.

2. _____.

3. _____.

4. _____.

5. _____.

## PART 2

**A) Complete the sentences with "*much, many, a lot of, some, any, a little, a few*".**

1. There is _____ chocolate. 
2. There aren't_____ eggs in the basket. 
3. There is _____ meat. We can't cook. 
4. There isn't _____ toothpaste on the tooth brush. 
5. There are _____ apples in the bag. Buy more! 
6. There is _____ fish. Let's cook. 
7. There aren't _____ biscuits. Go to the supermarket and buy. 

**B) Complete the sentences with the verbs in the box.**

| pollute | recycle | burn | bury | throw away |
|---|---|---|---|---|

**GREEN EARTH**

We shouldn't 1) _____ bottles. We should 2) _____ them. When you 3) _____ plastic, dangerous gases 4) _____ the atmosphere. If you 5) _____ plastic, it will stay in the ground for 1,000 years.

**C) Match the words in the boxes and write.**

| | |
|---|---|
| A bottle of | toothpaste |
| A bar of | shampoo |
| A carton of | washing powder |
| A tube of | chocolate |
| A roll of | apples |
| A box of | juice |
| A bag of | fizzy drink |
| A can of | toilet paper |

*A bottle of shampoo*

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

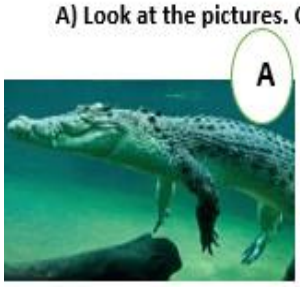
**D) Look at the picture. Complete the sentences with the words in the box.**


| | | | | | |
|---|---|---|---|---|---|
| bottle | box | tray | roll | jar | |
| carton | bag | can | bar | tube | packet |

1. There is a _____ of rice and cookies.
2. There is a _____ of onions and potatoes.
3. There is a _____ of soda.
4. There is a _____ of chicken, meat and fish.
5. There is a _____ of eggs and orange juice.
6. There is a _____ of bread rolls.

## PART 3

**A) Look at the pictures. Complete the sentences.**







Ex: A It's *swimming*.

B They're _____.

C It's _____.

D It's _____.

E It's _____.

F It's _____.

flying

~~swimming~~

jumping

running

walking

fighting



**B) Match.**

**Ex**. The elephants

have antlers

1. The eagles

have unique stripes.

2. The stags

laugh.

3. The bears

hibernate.

4. The zebras

see up to 2 miles.

5. The dinosaurs

became extinct.

## CURRICULUIM VITAE (CV)

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