THE EFFECTIVENESS OF VIRTUAL REALITY (VR) GOGGLES INTEGRATED VOCABULARY TEACHING ACTIVITIES ON VOCABULARY RETENTION AND VOCABULARY LEARNING MOTIVATION

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MASTER OF ARTS THESIS

Department of Foreign Languages Education
English Language Teaching Programme with Thesis
Advisor: Asst. Prof. Dr. Hakan DİLMAN

İstanbul
T.C. Maltepe University
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JÜRİ VE ENSTİTÜ ONAYI

Bu belge, Yükseköğretim Kurulu tarafından 19.01.2021 tarihli "Lisansüstü Tezlerin Elektronik Ortamda Toplanması, Düzenlenmesi ve Erişime Açılmasına İlişkin Yönerge" ile bildirilen 6689 Sayılı Kişisel Verilerin Korunması Kanunu kapsamında gizlenmiştir.

ETİK İLKE VE KURALLARA UYUM BEYANI

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DEDICATION

First and foremost, with the utmost admiration and gratitude, I dedicate these heartfelt words to my advisor Asst. Prof. Dr Hakan Dilman, my guiding light throughout this incredible journey of learning and growth. He has been the unwavering beacon, illuminating my path towards success, and I am forever indebted to his unwavering support, patience, and wisdom.

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Begüm ÇAKICI

July, 2023

ÖZET

SANAL GERÇEKLİK GÖZLÜĞÜ KULLANILAN KELİME ÖĞRETİMİ AKTİVİTELERİNİN KELİMEYİ AKILDA TUTMA VE KELİME ÖĞRENME MOTİVASYONU ÜZERİNDEKİ ETKİNLİĞİ

Begüm Çakıcı
Yabancı Diller Eğitimi Anabilim Dalı
İngiliz Dili Eğitimi Tezli Yüksek Lisans Programı
Danışman: Dr. Öğr. Üyesi Hakan Dilman
Maltepe Üniversitesi Lisansüstü Eğitim Enstitüsü, 2023

Bu çalışmada sanal gerçeklik gözlüğü ile bütünleştirilmiş sözcük öğretimi etkinliklerinin yapılmasının İstanbul'daki bir vakıf üniversitesinde İngilizce hazırlık okulunda eğitim gören öğrencilerin hedef sözcükleri akılda tutması ve sözcük öğrenme güdülenmesi üzerindeki etkisi incelenmiştir. Sanal gerçeklik gözlüğü ile ve geleneksel yöntemle hazırlanmış sözcük öğretim aktiviteleri, deney ve kontrol kümesi olmak üzere toplam 47 öğrenciye; 8 hafta boyunca uygulanmıştır. Uygulama süresinde öğrencilere testler yapılmıştır. Elde edilen veriler istatiksel olarak analiz edilmiştir. 15 hafta sonrasında odak grup ile yarı-yapılandırılmış görüşme yapılmıştır. Elde edilen veriler söylem analizi yapılarak analiz edilmiştir. Araştırma sonucunda, test sonuçlarına göre sanal gerçeklikle bütünleştirilmiş sözcük öğretimi aktivitelerinin kullanılmasının sözcüklerin akılda kalıcılığını artırdığı saptanmıştır. Odak grup ile yapılan yarı-yapılandırılmış mülakat sonucu sanal gerçeklik entegre edilmiş sözcük öğretiminin güdülenme, verimlilik, etkileşim, sözcükleri akılda tutma, sözcük dağarcığını genişletme, anlama, sesletim öğrenmeyi kolaylaştırma ve hedef dilin konuşulduğu ülkenin kültürünü öğrenme üzerinde olumlu etkileri olduğu belirlenmiştir.

Anahtar Sözcükler: 1. Sözcük öğretimi, 2. Sanal gerçeklik, 3. Sözcükleri akılda tutma, 4. Sözcük öğrenme güdülenmesi, 5. Yabancı dil öğretimi

ABSTRACT

THE EFFECTIVENESS OF VIRTUAL REALITY (VR) GOGGLES INTEGRATED VOCABULARY TEACHING ACTIVITIES ON VOCABULARY RETENTION AND VOCABULARY LEARNING MOTIVATION

Begüm Çakıcı
Department of Foreign Language Education
English Language Teaching Master's Programme
Thesis Advisor: Asst. Prof. Dr. Hakan Dilman
Maltepe University Graduate School, 2023

In this study, the effects of using VR integrated vocabulary teaching activities in an English preparatory school at a university in Istanbul on vocabulary retention and vocabulary learning motivation was investigated. Vocabulary was taught with VR integrated vocabulary teaching activities and traditional vocabulary activities to 47 students divided into experimental and control groups during 8 weeks. During the period, various tests were applied. Obtained data were analyzed statistically. After 15 weeks, semi-structured interviews were conducted with a focus group consisting 9 of students from the experimental group. The obtained data were analyzed by using discourse analysis. As a result of the research, it was found out that using VR integrated vocabulary teaching activities increased short-term and long-term vocabulary retention. As a result of the semi-structured interviews, it was found that VR integrated vocabulary teaching had positive effects on increasing motivation, productivity, interaction, vocabulary retention, vocabulary expansion and comprehension. Moreover, it was found that using VR in language lessons is entertaining, facilitates native-like pronunciation and teaches the target language speaking country’s culture.

Keywords: 1. Vocabulary teaching, 2. Virtual reality, 3. Vocabulary retention, 4. Vocabulary learning motivation, 5. Foreign language teaching

GENİŞLETİLMİŞ ÖZET

SANAL GERÇEKLİK GÖZLÜĞÜ KULLANILAN KELİME ÖĞRETİMİ AKTİVİTELERİNİN KELİMEYİ AKILDA TUTMA VE KELİME ÖĞRENME MOTİVASYONU ÜZERİNDEKİ ETKİNLİĞİ

Bu çalışmada sanal gerçeklik gözlüğü ile bütünleştirilmiş sözcük öğretimi etkinliklerinin yapılmasının İstanbul'daki bir vakıf üniversitesinde İngilizce hazırlık okulundaki öğrencilerin hedef sözcükleri akılda tutması ve sözcük öğrenme güdülenmesi üzerindeki etkisi incelenmiştir. Bu çalışma, aşağıdaki iki araştırma sorusuna yanıt vermek için yapılmıştır.

Bu çalışmada hem nicel hem nitel veri kullanılmıştır. Bu araştırmanın katılımcıları, İstanbul'da bir üniversitede İngilizce hazırlık programına kayıtlı olan üniversite öğrencileridir. Araştırmaya araştırmacının İngilizce öğretmeni olduğu 2 farklı hazırlık sınıfından toplam 47 öğrenci gönüllü olarak katılmıştır. Katılımcıların ortalama yaşı 18'dir ve İngilizce seviyeleri başlangıç olarak belirlenmiştir. Araştırma, deney ve kontrol grubu olarak iki ayrı sınıfta yürütülmüştür. Bu iki sınıf, 2022-2023 akademik yılı boyunca İngilizce öğretmek üzere idare tarafından araştırmacıya tahsis edilen sınıflardır.

Amaç doğrultusunda kontrol grubuna geleneksel yöntemle, deney grubuna ise sanal gerçeklik gözlüğü ile bütünleştirilmiş sözcük öğretim etkinlikleri ile hedef sözcükler öğretilmiştir. Araştırma 8 hafta sürmüştür. Uygulama süresinde öğrencilere çeşitli testler yapılmıştır. Araştırmanın başlangıcında, her iki gruba araştırma süresince öğretilen hedef sözcükleri bilip bilmediklerini değerlendirmek amacıyla bir ön test uygulanmıştır. Test sonucu iki grubunda aynı seviyede olduğu belirlenmiştir. 8 hafta boyunca her hafta iki grubu da aynı 10 hedef sözcük öğretilmiştir. Her hafta, her dersin sonunda kısa sınav yapılmıştır. Süreç sonunda her iki grup tarafından toplamda 8 kısa sınav yapılmıştır.

5. haftada revizyon testi-I, 9. haftada da revizyon testi-II yapılmıştır. 8 hafta sonunda ve süreç içerisinde herhangi bir zaman hedef sözcükleri içeren tekrar yapılmamıştır. 15

haftanın sonunda her iki gruba da son test uygulanmıştır. Ön test, revizyon testi-I, revizyon testi-II ve 8 kısa sınav öğrenciler tarafından üniversitede, sınıflarında ve ders saatlerinde yapılmıştır. Ancak araştırma sonuna yakın deprem nedeniyle Türkiye'deki tüm üniversiteler online eğitim vermeye başlamıştır. Bu nedenle son test Zoom üzerinden online olarak yapılmıştır. Elde edilen veriler istatiksel olarak analiz edilmiştir.

Araştırma amacına uygun olarak ikinci aşama, 15. haftanın sonunda gerçekleştirilen odak grup görüşmelerinin uygulanmasını içermektedir. Deney grubundan 9 öğrenciden oluşan bir odak grup oluşturulmuştur. Odak grubu son testten en yüksek puan alan 3 öğrenci, orta puan alan 3 öğrenci ve en düşük puan alan 3 öğrenciden oluşturmuştur. Online eğitim olduğu için mülakatlar Zoom üzerinden yapılmıştır. Çevrimiçi toplantıda odak grup öğrencilerine sanal gerçeklik gözlüğü ile bütünleştirilmiş sözcük öğretim etkinlikleri hakkında görüşlerini almak için tek tek yarı yapılandırılmış görüşme soruları sorulmuştur. Araştırmaya katılan öğrenciler gönüllü olarak katılmış ve uygulama öncesinde araştırma hakkında bilgilendirilmişlerdir. Elde edilen veriler söylem analizi yapılarak analiz edilmiştir. Deney grubundan seçilen 9 odak grup öğrencisine aşağıdaki yarı yapılandırılmış görüşme soruları ana dillerinde sorulmuştur.

1. Sanal gerçeklik ile bütünleştirilmiş etkinliklerle sözcük öğretimi hakkındaki genel düşünceleriniz nelerdir?
2. Sanal gerçeklikle bütünleştirilmiş sözcük öğretimi etkinlikleri ile önceki yıllarda yabancı dil öğretim sürecinde yaptığınız sözcük öğretimi etkinliklerini karşılaştırabilir misiniz?
3. Sanal gerçeklikle bütünleştirilmiş etkinliklerin İngilizce sözcük öğreniminize etkileri hakkında ne düşünüyorsunuz?

On beş haftalık çalışma boyunca hedef sözcükleri öğretmek için çeşitli etkinlikler yapışmıştır. Her etkinliğin amacı, öğrencilerin ders sırasında sözcük edinmeye yönelik motivasyonlarını ve onları akılda tutma yeteneklerini artırmaktı. Hedef sözcükler, LearnEnglishInVr adlı bir YouTube kanalından seçildi. Seçilen her 3 boyutlu videodan 10 hedef sözcük belirlendi. 8 hafta boyunca belirlenen 80 hedef sözcük, kontrol grubuna 3 boyutlu videolar ve sanal gerçeklik gözlükleri kullanılmadan geleneksel yöntemlerle PowerPoint ve bilgi kartları kullanılarak; deney grubuna ise sanal gerçeklik gözlüğü

kullanılarak öğretildi. Her iki gruba da hedef sözcüklerin sesletiminde kullanılan IPA sembolleri kelime öğretimiyle eş zamanlı olarak öğretildi.

Araştırma sonucunda, araştırmaya katılan öğrencilerin test sonuçlarına göre sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi etkinliklerinin kullanılmasının sözcüklerin akılda kalıcılığını artırdığı saptanmıştır. Odak grup ile yapılan yarı-yapılandırılmış görüşme sonucu sanal gerçeklik ile bütünleştirilmiş sözcük öğretiminin motivasyon, verimlilik, etkileşim, sözcükleri akılda tutma, sözcük dağarcığını genişletme, anlama, sesletim öğrenmeyi kolaylaştırma ve hedef dilin konuşulduğu ülkenin kültürünü öğrenme üzerinde olumlu etkileri olduğu belirlenmiştir. Ayrıca sanal gerçeklik ile yapılan sözcük öğretiminin yararlı ve eğlenceli olduğu kanısına varılmıştır.

Kontrol grubu dersinde her hafta öğretmen sözcükleri slayttan okudu ve öğrenciler sesletimlerini duydu. Öğretmen sözcüklerin sesletimine ait IPA sembollerini göstermiş ve öğretmiştir. Öğretmen, kontrol grubu dersinde hedef sözcükleri kullanarak sözlü çeviri, cümle yazma, tekrarlayarak ezberletme gibi farklı etkinlikler yapmıştır. Deney grubuna her hafta aynı 10 hedef sözcük sanal gerçeklikle bütünleştirilmiş sözcük öğretimi etkinlikleri ile öğretilmiştir. Her derste öğretmen çiftler oluşturdu, ardından sanal gerçeklik gözlükleri ve video bağlantılarını öğrencilere verdi. Öğrenciler ayağa kalktı, sanal gerçeklik gözlüklerini taktı ve 3 boyutlu videoları partnerleriyle sırayla izledi. Sanal gerçeklik ortamını keşfettiler ve hedef sözcükleri öğrendiler. Daha sonra hatırladıkları sözcükleri listelediler. Ardından videodan ne gördüklerini ve ne anladıklarını partnerlerine açıkladılar. Öğretmen, sesletim çalışması yapmak için hedef sözcüklerin sesletimine ait IPA sembolleri öğretti. Hedef sözcükler kullanılarak poster yapılması gibi etkinlikler yapıldı.

Yapılan tüm testler ve kısa sınavlar sonucunda, kontrol grubu öğrencilerinin notlarının deney grubu öğrencilerine göre oldukça düşük olduğu belirlendi. Bunun nedeni, kontrol grubu öğrencilerine hedef sözcükleri öğretmek için geleneksel sözcük öğretimi etkinliklerinin kullanılmasıdır. Deney grubu öğrencileri, geleneksel sözcük öğretimi etkinliklerinin sözcükleri öğrenmek ve akılda tutmak için yeterli olmadığını açıklamıştır. Öğrencilere göre geleneksel sözcük öğretimi etkinlikleri ezbere ve çeviriye dayalıdır.

Öğrenciler, sanal gerçeklik ile geleneksel sözcük öğretimi etkinliklerini karşılaştırdıklarında, sanal gerçeklik ile öğrenmenin daha iyi olduğunu belirtmiştir.

Öğrenciler hayatlarında ilk kez sanal gerçeklik ile eğitim aldı. Çalışma sonucunda sanal gerçeklik ile sözcük öğretiminin sözcüklerin kısa ve uzun vadede akılda kalıcılığı üzerinde olumlu etkisi olduğu tespit edilmiştir. Deney grubu öğrencilerinin test ve kısa sınav sonuçları kontrol grubuna göre çok daha yüksektir. Sanal gerçeklik ile sözcük öğretildikten sonra öğrenciler hedef sözcükleri dersten hemen sonra, birkaç hafta ve birkaç ay sonra akıllarında tutabildiler. Çünkü sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi, 3 boyutlu görseller ve ses içerir. Öğrenciler sözcüklerin sesletimini duydu, gerçek hayattaki gibi görselleri gördü ve sınıf içinde dolaşarak, hareket halinde sanal gerçeklik ortamını keşfederek öğrendi. Böylece daha fazla duyu devreye girdi. Bu da sözcüklerin daha fazla akılda kalmasını sağladı.

Son testte ikiden fazla hece veya tamlama içeren sözcükler her iki grup tarafından ortak olarak yanlış cevaplanan sözcükler arasındadır. Bu nedenle uzun sözcüklerin akılda tutulmasının zor olduğu söylenebilir. Yine de deney grubu daha az hata yaptı. Ayrıca sesletim öğrenimini değerlendirmek için IPA sembolleri öğretilmiş ve testlerde hedef sözcüklerin IPA sembolleri yazılışı sorulmuştur. Öğrenciler tüm IPA sembolleri hatırlayamadılar ve sesletimle ilgili soruların çoğunu yanlış cevapladılar. Normalde, sözcükleri sözlü olarak telaffuz edebildiler. Bu nedenle, IPA sembollerini öğretmek zordur ve bu sembolleri öğrenmek zaman ve daha fazla pratik gerektirir.

Bu çalışmanın bir sonraki amacı, sanal gerçeklikle bütünleştirilmiş sözcük öğretim etkinlikleri kullanmanın sözcük öğrenme güdülenmesi üzerindeki etkisini belirlemekti. Öğrencilerin sanal gerçeklik ile bütünleştirilmiş ve geleneksel sözcük öğretimi etkinlikleri hakkındaki görüşleri alındı. Bulgular, sanal gerçeklik ile bütünleştirilmiş sözcük öğretiminin kısa ve uzun vadede sözcükleri akılda tutma ve sözcük öğrenme güdülenmesi üzerinde olumlu bir etkiye sahip olduğunu gösterdi. Öğrenciler sanal gerçeklik ile etkinlikleri yaparken çok dikkatli ve istekli bir şekilde derse katıldılar. Verilen her talimatı yerine getirdiler. Öğrenciler, sanal gerçeklik sayesinde derse istekli ve dikkatli katılımlarının sözcükleri öğrenmelerini ve hatırlamalarını kolaylaştırdığını açıkladılar.

Hedef dildeki sözcükler sanal gerçeklik kullanılarak kolaylıkla öğrenilebilir. Öğrenciler, sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi etkinlerinin yapılmasının üretkenliği, etkileşimi artırdığını, sözcük dağarcığını genişlettiğini ve sesletim öğrenmeyi kolaylaştırdığını ifade ettiler. Öğrenciler, sanal gerçeklik deneyimi aracılığıyla öğrendikleri sözcükleri cümleler oluşturmak için kolaylıkla hatırlayıp kullanabildiler. Sanal gerçeklik ile yapılan etkinlikler aracılığıyla sınıf arkadaşları ve öğretmenle etkili iletişim kurabildiklerini ifade ettiler. Sanal gerçekliğin mümkün kıldığı üretkenlik ve etkileşimdeki artış sayesinde sözcük dağarcığının kullanımı arttı. Bu şekilde sanal gerçeklik kullanımı, sözcük dağarcığını genişletmeye yardımcı oldu. Öğrenciler sanal gerçeklik deneyimi sayesinde sözcüklerin sesletimini duydular ve yapılan etkinliklerle sesletimleri pekiştirdiler.

Sanal gerçeklik deneyimi, 3 boyutlu görsellerle desteklenmesi nedeniyle, öğrencilere hedef dilin sözcük dağarcığının gerçek yaşam ortamında kullanımını görme şansı verir. Öğrenciler, 3 boyutlu görsellerle desteklendiği için sözcük öğrenmek amacıyla sanal gerçeklik kullanmanın geleneksel ve diğer yöntemlere göre çok daha iyi olduğunu bildirdiler. Öğrenciler ayrıca sanal gerçekliğin gerçek yaşam ortamından 3 boyutlu görsellerle desteklendiği için hedef dilin konuşulduğu ülke kültürünün öğrenilmesini mümkün kıldığını söylediler. Kısacası sanal gerçeklik, gerçek hayattan 3 boyutlu görsellerle desteklendiği için hedef dilde sözcük öğrenimini kolaylaştırır ve hedef dilin konuşulduğu ülkenin kültürünün öğrenilmesini sağlar.

Öğrenciler sanal gerçeklik gözlüklerini taktılar ve sınıf içerisinde yürüyerek sanal ortamı keşfettiler. Hareketi sanal gerçeklik deneyimiyle birleştirmek, odaklanmayı ve konsantrasyonu artırdı. Öğrenme etkinlikleri sırasında sınıf ortamında fiziksel hareket içeren bir tekniğin kullanılması öğrencilerin kinestetik zekasını kullanmalarını sağlamıştır. Bu sayede öğrenciler öğrenirken eğlendiler. Tüm öğrenciler sözcük öğretiminde sanal gerçeklik kullanımının eğlenceli olduğunu ve derse katılımlarını artırdığını ifade etmişlerdir. Sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi eğlenceli bir etkinlik olduğu için sözcük öğrenimini teşvik eder.

Öğrenciler, sözcük öğretimi için sanal gereklik ile birlikte beyin temelli öğretim yaklaşımının kullanılmasıyla, öğrenme sürecini geliştirme, aktif katılımı teşvik etme ve alışılmadık terimleri daha derinlemesine anlama potansiyeline sahip oldular. Çünkü

öğrenciler kendilerini sanal ortamda hissetmişlerdir. Öğrenciler bir mevcudiyet duygusu yaşadıklarında, bilişsel yetenekleri arttı ve bu da öğrenme sürecine karşı güdülenmenin artmasıyla sonuçlandı. Bu da sözcük dağarcığının akılda tutulmasına olumlu etki etti. Bu sayede öğrenciler geleneksel yöntemlere göre daha iyi öğrendiler.

Beyin temelli öğrenmeye dayalı ilkelerin sanal gerçeklik teknolojisiyle sözcük öğretimine dahil edilmesi, potansiyel olarak dil eğitimi sunumunu değiştirebilir. Beyin temelli öğrenmenin sözcük öğretimi üzerindeki önemli etkisi, dil edinimi ve beynin öğrenilen ögeleri hafızada tutması gibi doğal süreçlerle uyumlu stratejilerin uygulanması yoluyla açıkça görülmektedir. Eğitmenler, sanal gerçekliğin gücünden yararlanarak ve beyin temelli öğrenme yaklaşımını uygulayarak, öğrencilerin gereksinimlerini karşılayan büyüleyici ve etkili sözcük öğretimi fırsatları oluşturma kapasitesine sahiptir. Bu araştırmada beyin temelli yaklaşımın sanal gerçeklik teknolojisiyle birlikte kullanılması, sözcük dağarcığının akılda tutulmasının yanı sıra sözcük öğrenme güdülenmesini artırdı ve öğrenciler arasında gelişmiş dilsel ve iletişimsel yeterliliklerle sonuçlandı.

Yeni bir şey öğrenirken yüksek güdülenmeye sahip olmak önemlidir. Aynı zamanda öğrenme sürecinin eğlenceli olması da insanları motive eder. Sözcük öğretme etkinliklerini sanal gerçeklik ile yürütmek, öğrencilerin sözcük öğrenme güdülenmesini artırır ve dersleri eğlenceli hale getirir. Bu durum hedef sözcükleri öğrenme sürecini kolaylaştırır. Öğrenciler, sanal gerçeklikle bütünleştirilmiş sözcük öğrenme etkinliklerinin sözcük öğrenme güdülenmesini artırdığını ve ilgi çekici olduğunu söylediler. Ayrıca öğrenciler bu etkinliklerin faydalı olduğunu belirtmişlerdir. Sanal gerçeklik kullanılan sözcük öğretimi etkinlikleri, öğrenmeyi daha hızlı ve daha kolay hale getirdiği için yararlıdır. Öğrenilen sözcükler sayesinde öğrenciler hedef sözcükleri günlük hayatlarında kullanabilirler. Yeni bir dil öğrenirken verilen girdilerin anlaşılır olması öğrenme sürecini kolaylaştırır. Dil öğrenme sürecinde anlaşılır girdiler vermek, öğrenmenin gerçekleşmesi için çok önemlidir. Öğrenciler, sanal gerçeklik ile sözcük öğretimi etkinlikleri sayesinde öğrenme sürecinin daha anlaşılır hale geldiğini belirtmişlerdir. Sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi etkinlikleri ile öğrenme süreci anlaşılır hale gelir. Sonuç olarak, sanal gerçeklik ile bütünleştirilmiş sözcük öğretimi etkinliklerinin sözcük öğretiminde kullanılmasının birçok olumlu sonucu bulunmuştur.

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ABBREVIATIONS

3D	: 3 Dimension
AR	: Augmented Reality
CAI	: Computer-Assisted Instruction
CBT	: Computer-Based Training
CS	: Control Group Student
IPA	: International Phonetic Alphabet
EFL	: English As a Foreign Language
ES	: Experimental Group Student
ESP	: English for Specific Purposes
FL	: Foreign Language

CHAPTER 1. INTRODUCTION

In an increasingly globalized world, the importance of learning new languages is increasing day by day. Learning a new language involves learning different parts such as listening, speaking, reading, writing, grammar, vocabulary and idioms. Learning vocabulary represents one of the most crucial competencies in the acquisition of language. One's ability to communicate linguistically is strongly impacted by the extent of his or her vocabulary. Thus, the primary goal of vocabulary training is to help students expand their vocabulary. Ismailova & Feruza (2021) maintained that numerous strategies for acquiring vocabulary were put forth. Schmitt (1997) classified vocabulary learning strategies as "determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies". However, language learners are not aware of different vocabulary learning strategies and resort to the memorization technique.

When it comes to teaching vocabulary in English in schools, teachers are always under pressure with specific topics to follow. Yang & Dai (2011) stated that while teaching vocabulary in language, it is sometimes taught ineffectively or haphazardly, for instance by providing word lists for memorizing. On the other hand, students are also forced to learn a lot in a short time and are expected to score high and pass language tests or exams. This situation pushes the teachers to utter the word definitions in their mother language, and the students memorize the translations of target words in foreign language. Balcı & Çakır (2012) maintained that when teaching vocabulary in EFL classrooms in Turkish schools, teachers typically favor using traditional methods. Bearing memorized words with traditional techniques in mind can be more difficult.

Words are the essential components of a language. For this reason, retention of the words taught in schools is crucial. However, retention of the words memorized is not high. Mondria (2003) stated that the inquiry as to whether the utilization of learning techniques involving the inference of a word's meaning from its contextual cues yields improved retention outcomes as compared to methods whereby a word's definition is explicitly provided. With this way, the retention of the learned words increases. Enhanced student

engagement in the process of acquiring and memorizing new vocabulary leads to a higher level of retention of target words. Therefore, teachers should prepare various vocabulary teaching materials for students to be active in vocabulary learning process. Thanks to different vocabulary teaching activities, students may become more engaged in the lesson. Kırmızı & Kömeç (2019) stated that students can participate in communicative activities and actively employ the target vocabulary in the classroom. The active engagement of students in the process of acquiring new vocabulary has been observed to potentially enhance their retention of words.

The 21st century has seen notable advancements in technology. Technology is now used more and more frequently across all industries. The utilization of technology in the realm of education has experienced a noticeable surge in recent times. Erol (2021) pointed out that in the globalized world, information spreads quickly and reaches enormous populations, but it also continues to change in terms of its significance and value. These factors have made it intriguing to consider how to impart this evolving knowledge and apply new technology to education. This makes teachers wonder how lessons will be held in the future. Indeed, the integration of computers in the educational setting has facilitated the dissemination of knowledge by the instructors and the acquisition of knowledge by the learners. Integrating technology in education not only ensures easy acquisition of knowledge, but also makes the learning process more enjoyable. Raja & Nagasubramani (2018) stated that integrating technology has enhanced the satisfaction of teaching and learning.

In recent years, the integration of virtual reality technology has gained widespread adoption across various fields owing to its increasing popularity. Integrating virtual reality in education also started to use in education. According to Pantelidis (2009) one of the developments of computer-assisted instruction (CAI) is using virtual reality in education. Language teachers can prepare remarkable materials by using virtual reality in their classes. The subject matter that is commonly taught within the confines of a classroom setting can be effectively taught through the incorporation of VR integrated act. In this way, many senses of the students come into play. Students feel themselves in the environment of the subject they will learn and they have the opportunity to explore

this environment in a natural way. Thanks to integrating VR in education, students can see the object, situation and environment related to the target subject as they are in real life. This allows the students to learn by experience. For example, while teaching the subject of wild animals, the teachers can find a 3D video or image related to this subject for students who have never seen jungle or wild animals in their life. With VR goggles, they can show their students this 3D video or image and have them do activities.

Virtual reality can be used in schools to lessen the impact of student differences on subject learning. This happens because when students see sections that look like real life, they feel more comfortable and better able to learn. Haar et al. (2002) stated that as student populations become more diverse, the ability to teach according to the needs of different students became increasingly significant. For students with visual, auditory and kinesthetic intelligence, these activities are offered at the same time. Allcoat & Mühlenen (2018) indicated that as rich visual projections, audio, and movement tracking are all possible with VR headsets, all three of these learning methods can be catered to in a single application. Thus, using VR in the classroom can help students with differed learning styles learn more effectively.

Various methods, techniques and activities are used while teaching vocabulary in schools. However, one of the most common techniques is memorization. Students are made to memorize words. Khoii & Shariffar (2013) maintained that over the past 30 years, memorization as a language acquisition strategy has faced significant opposition in support of more communicative, constructivist, and thought-oriented approaches. It is important to stay motivated while learning vocabulary. For this reason, in addition to traditional techniques, activities that will increase the motivation of students to learn vocabulary should be chosen. Developing technology and students' interests ought to be considered as well. Today, students are busy with the internet and most of them are aware of new technological tools. At this point, the opportunities of developing technology can be applicable to instruction. One of the emerging and interesting technology is VR. Zheng et al. (1998) explained that a sophisticated human-computer interface that simulates a real-world setting is virtual reality (VR). With using VR in language lesson, the retention of newly learned English vocabulary by students can be higher.

VR goggles allow students to engage with the virtual environment. Vocabulary can be taught using VR goggles in English language teaching. Students see the target words they will learn in the virtual environment with VR goggles. VR goggles can be used with 3D images and videos. Normally videos are passive materials. Students watch and listen. Thanks to VR goggles, videos can be made interactive since VR allows for a direct interaction with the environment. Allcoat & Mühlenen (2018) revealed that all disciplines can benefit from interaction and feedback, as interactive learning has several advantages over passive learning because it encourages active learning. Thus, using VR goggles for vocabulary teaching in English lessons can help students to learn. Students may not forget the words they learned by experiencing virtual reality in the long term. Smith et al. (2016) stated that with emerging evidence that VR use can promote retention through the improvement of procedural memory, VR use may be the pedagogy of choice. The use of VR goggles integrated vocabulary teaching activities can increase vocabulary retention in English lessons.

1.1 Statement of the Problem

Learning and teaching vocabulary in a new language is a challenging task and it is important to stay motivated while learning something challenging. Moreover, the retention of words taught in schools with traditional techniques and activities such as memorizing, filling in the blanks, and translating their meanings into the native language is not high in the short and long term. Most of the English words taught in schools are forgotten after a while. People who want to speak a new language fluently should learn lots of words in the target language. Sagar & McNeill (2018) pointed out that in their first language, native speakers often know 15,000–20,000-word families, or lemmas. For a language learner, learning so many words may sound impossible. According to Snauwaert (2021), 5000 most common words in conversational English, cover 90% of spoken language. In light of this, it is believed that knowing about 5000 words is enough to understand and speak a language fluently. Learning 5000 words in a memorable way is difficult. So, vocabulary teaching should be done with innovative and technology-integrated techniques rather than classical techniques. In this way, it can be easier to be motivated and remember the learned words.

1.2 Aim of the Study

The present study is focused on exploring the effects of using VR goggles integrated vocabulary teaching activities. Specifically, the aim of this study is to assess the extent to which this approach can improve English vocabulary retention among students, while simultaneously enhancing their motivation to learn new vocabulary. For this reason, VR goggles integrated vocabulary teaching activities were implemented in university preparatory school English lessons, and the effects on students' vocabulary retention was assessed. In addition, in the study, students' opinions about VR goggles integrated vocabulary teaching process were taken.

1.3 Significance of the Study

Various methods are used to teach vocabulary in schools. 21st century is a century in which technology develops rapidly and various technological tools are invented. Innovations can be integrated into education. The imperative to instruct English as a additional language is of utmost importance owing to the fact that English stands as one of the most prevalent languages worldwide. The use of technological innovations in English lessons can increase efficiency. Also, students can quickly adapt to new technological tools. For this reason, teachers should use the technological tools in their lessons. Expanding one's vocabulary is widely recognized as an indispensable element in the process of acquiring proficiency in a novel language. It would be great to use VR goggles integrated vocabulary teaching activities to increase the retention of new words learned. Thanks to VR goggles, students will get the opportunity to see the forms of the words they will learn in real life and how they are used in three dimensions. Thus, students will feel that they are in an environment where the target language they are learning is spoken. Since many sense organs and learning by experience are involved, the words that students learn will be memorable. Limited research has been conducted regarding the effect of incorporating VR goggles in instructional methodologies aimed at enhancing vocabulary instruction. The findings obtained from this study are expected to significantly augment the limited body of knowledge pertaining to the aforementioned research void.

1.4 Limitations

Even though this research study was carried out attentively, there were certain limitations that should be considered for future studies. This study applied to university preparatory school in a foundational university in Istanbul. It can be done again in different universities around the world. Also, vocabulary teaching was done with VR for 8 weeks.

1.5 Keywords and Identification

In this study, the effects of using virtual reality in language lessons on vocabulary retention and vocabulary learning motivation were investigated. Hence, the keywords of this research are vocabulary teaching, virtual reality, vocabulary retention, vocabulary learning motivation and foreign language teaching.

Virtual reality (VR): “Virtual reality (VR) is a computer-generated immersive three-dimensional visualization with which users can interact (Pospigliosi, 2022)”.

Retention: “Retention refers to the continued possession, use, or control of something (Efendi et al., 2019)”.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The primary objective of this chapter is to provide contextual information for the aims of the present research. The goal of this research is to evaluate the effectiveness of integrating virtual reality into vocabulary instruction as a means of enhancing vocabulary retention. Additionally, the study aims to explore the perspectives of students regarding this pedagogical approach. The definition of VR, its functions, its use in education and second language learning are defined. Then information about the relationship between teaching vocabulary and VR is provided.

2.2 Vocabulary Teaching

One of a language's most vital components is its vocabulary. According to Read (2004), language learners are typically cognizant of the degree to which their deficient vocabulary knowledge hinders their ability to engage in effective communicative endeavors in the desired language. The reason behind this is that the words add meaning and carry information to the message that is intended to be conveyed. That's why vocabulary teaching is really important in language teaching.

Teachers should teach aspects of vocabulary in language lessons. These aspects are form, meaning and usage of the word. Nontasee & Sukying (2021) pointed out that the aspects of form and meaning are essential for the production of a word. While form is the physical image of something, meaning is the interpretation connected to that form. Taft (2003) gave an example and explained the word form cat is found in a context that refers to a furry, whiskered pet that says "miaow", but that context can vary in other ways. So, the form of a cat is its physical existence—a creature with four legs, a tail, and fur. The meaning of a cat is that it is a domestic small mammal. Also, in order to expand the vocabulary and use it effectively when speaking or writing, it is necessary to understand how vocabulary is used. Here usage comes into play.

Teachers should also teach students correct pronunciation of the word to improve students' vocabulary mastery. As stated by Ambarwati & Mandasari (2020), if students cannot pronounce words well, this can make them difficult to understand or even misunderstood. However, out of all the word-related aspects, pronunciation could be the hardest to acquire. According to by Gilakjani & Ahmadi (2011), the mastery of pronunciation poses a significant challenge for language learners and is often a topic that educators express distaste for instructing in the classroom. While students are learning to pronounce words, learning the phonetic alphabet can affect the correct pronunciation of the learned word. Brown (2012) explained that The International Phonetic Alphabet (IPA) comprises a collection of symbols that is specifically designated for the purpose of articulating the spoken phonemes across diverse languages. Students may need some time to study and practice the IPA alphabet because it is difficult to master. Trazo et al. (2019) study found that the IPA front vowel sounds are difficult to recognize by language learners.

The learning of vocabulary is impacted by a variety of factors. According to Laufer (1990), the ease or difficulty of acquiring vocabulary can be influenced by certain defining characteristics. There were several of these: phonological factors include pronounceability and length; "grammatical factors include part of speech, inflexional complexity, and derivational complexity; semantic factors include abstractness, specificity, and idiom; and register limits include the multiplicity of meaning.

It can be challenging for students to write down a word they know how to pronounce. When students are asked for this, they can make spelling mistakes in English. Since in this instance students have to remember the form of the word and spell it. Susanto (2021) discovered that the students' struggles with vocabulary acquisition were having trouble pronouncing words, writing and spelling, pronouncing a word of various grammatical type called inflection. Various factors contribute to the challenges that students encounter when attempting to grasp the pronunciation and form of words. Susanso's data (2021) comprised a few factors that induced students' troubles in acquiring vocabulary as following:

> (1) the written type is totally different from the spoken form in English, (2) the quantity of words that students got to learn is extremely large, (3) the constraints of sources of data regarding words, (4) The quality of word knowledge. Cognizing a word affects far more acknowledging it has lexicon definition, (5) gets by deficiency of apprehension of grammatical of the words, (6) the amiss pronunciation is commonly induced along the deficiency of sound similarity between English language and also the students' linguistic communication (Susanto, 2021, p. 49).

The part of speech of the newly learned word belongs to can also affect vocabulary learning. Haslam (2018) stated that English has eight traditional parts of speech: “noun, pronoun, verb, adjective, adverb, preposition, conjunction, and interjection”. Parts of the speech give grammatical knowledge about the word. Vocabulary learning and grammatical knowledge are interrelated. For this reason, students should learn which parts of speech the words they learn belong to. In this way, the learned words can be used correctly in a sentence and word learnability becomes easier. Nontasee & Sukying (2021) maintained that understanding the nature of word learnability can guide and improve the explicit teaching of vocabulary. Word learnability can increase if students learn parts of the speech of the words.

The syllable number of the new words learned can also affect the word learnability. Words that possess greater than two syllables may present a higher level of difficulty for acquisition. Laufer (1990) found that long words produced more errors than shorter ones in recognition tasks. Thus, words with short syllables are learned more easily. Baddeley et al.’s study (1975) found that when considering a constant number of syllables and phonemes, the recollection of shorter words is notably superior to that of longer words. Schmidt (2008) also stated that recall of short words is generally higher than the recall of long words. In addition, short words may be easier to learn as they are pronounced faster.

2.3 Vocabulary Teaching Activities and Learning Styles

Vocabulary development is an important component when learning English. According to Folse (2008), students can express concepts to some extent using a basic vocabulary,

but in order to speak fluently, write, listen, and read more effectively, it is required to master more words.

People have individual differences and learning styles. Pashler et al. (2008) explained the term ‘‘learning styles’’ as the concept that that differs according to the most effective way of teaching or working for individuals. There are students in a classroom who have diverse learning styles. Mantri et al. (2011) stated that “visual (spatial), aural (auditory-musical), verbal (linguistic), physical (kinaesthetic), logical (mathematical), and social (interpersonal) learning styles” are the terms with the highest usage frequency. Also, individuals have different types of intelligence. Morgan (1996) explained Gardner’s seven intelligences as following:

Table 1. Gardner’s Seven Intelligences (Morgan, 1996)

Logical-mathematical
Sensitivity to, and capacity to discern, logical or numerical patterns; ability to handle long chains of reasoning.
END STATES: Scientist, Mathematician
Linguistic
Sensitivity to the sounds, rhythms, and meanings of words; sensitivity to the different functions of language.
END STATES: Poet, Journalist
Musical
Abilities to produce and appreciate rhythm, pitch, and timbre; appreciation of the forms of musical expressiveness.
END STATES: Composer, Violinist
Spatial
Capacities to perceive the visual-spatial world accurately and to perform transformations on one's initial perceptions.
END STATES: Navigator, Sculptor
Bodily-kinesthetic
Abilities to control one's body movements and to handle objects skillfully.
END STATES: Dancer, Athlete

Table 1. Gardner's Seven Intelligences (continued) (Morgan, 1996)

Interpersonal Capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people. END STATES: Therapist, Salesman **Intrapersonal** Access to one's own feelings and the ability to discriminate among them and draw upon them to guide behavior; knowledge of one's own strengths, weaknesses, desires, and intelligences. END STATES: Person with detailed accurate self-knowledge

Given the diverse range of learners possessing varying learning styles and intelligences, it is paramount to carefully select vocabulary teachings methods that cater to the diverse intelligences and learning preferences of the students within a classroom. Ashraf et al. (2014) believed that fun activities can help establish the relationship between words and other items, thus establishing a vocabulary network. By using fun activities such as games in vocabulary teaching, students with different learning types and intelligence can participate more actively in the lesson. Read (2004) maintained that students can easily use an electronic dictionary or hyperlinks that provide glosses and other helpful information about specific words in the text that they are unlikely to know when completing reading assignments on a computer. Thus, reading activities done on a computer can be preferred at some intervals for teaching vocabulary, too.

Even more activities are suggested for vocabulary teaching. Nation (1994) suggested that different vocabulary teaching exercises should be carried out for learning new vocabulary for the first time to establish previously learned language, enhance previously learned vocabulary, build vocabulary methods, and improve fluency with learned vocabulary.

Acording to Kacani & Cyfeku (2015), vocabulary teaching activities can be done while enhancing listening and speaking abilities. For example, text vocabulary categorized as either active or passive, repetition can be organized and focused effectively, effective

teaching and learning activities can be selected, and the target foreign language can be employed at different points throughout the class. Also, thanks to these listening activities native-like pronunciation can be learned. Alemi & Khatoony (2020) recommended that virtual reality could be used to improve EFL students' pronunciation abilities and aid in the development of native-like pronunciation. Na et al. (2020) believed that students are anticipated to improve their English pronunciation through the use of such VR applications.

When conducting a vocabulary-teaching activity, it is imperative to take into account several factors, such as the learners' age, level, and individual needs. Failure to consider these considerations may adversely affect the effectiveness of the instructional approach used. The utilization of technology in vocabulary instruction is imperative in the contemporary era owing to its inherent benefits in the twenty-first century. Kilickaya & Krajka (2010) maintained that using technology to complement various ways for vocabulary teaching and learning will empower the process. Technology includes many tools. Computer games, Web 2.0 tools, online learning platforms, multimedia are just a few of them. Constantinescu's study (2007) found that multimedia is crucial for both vocabulary learning and reading comprehension, thus the potential benefits of integrating technology into the language classroom should be considered by teachers. Eren's study's findings (2015) revealed that practically all students participated in the study are generally supportive of the usage of Web 2.0 tools in the classroom. For these reasons, various technological tools should be used while teaching vocabulary.

2.4 Brain-Based Learning

The brain, being a prominent organ of the human body, plays a crucial role in executing various physiological functions. Furthermore, the brain exhibits an active involvement in the process of learning. Brain-based learning is an instructional approach that builds on the knowledge gleaned from neuroscience and cognitive psychology to maximize learning. According to Caine & Caine (1994), brain-based learning involves accepting the rules of how the brain works, and then organizing instruction with these rules in mind to achieve meaningful learning. It stresses understanding the brain's processes and altering teaching practices to be compatible with the brain's natural learning processes.

The basic concept is that when educational practices are in tune with the brain's natural process, learning becomes more efficient, enjoyable and effective.

Through gaining insight into the functioning of the brain and utilizing this knowledge in instructional methods, brain-based learning attempts to produce a more captivating, successful, and pleasing learning experience for students of all ages. Salem (2017) maintained that brain-based learning is a natural, motivating and positive approach that supports and maximizes learning and teaching. It promotes a comprehensive attitude to education that takes into account the intellectual and affective elements of learning, enabling students to realize their highest capacity.

2.5 Vocabulary Retention

Numerous strategies and methodologies have been proposed to efficiently and effectively instruct foreign language learners in vocabulary acquisition with the aim of enhancing retention and speed of acquisition. Asyiah's study (2017) found that students who use the Metacognitive technique to remember and store language likely to perform better than those who use the Cognitive or Social strategy. As can be seen, the use of different vocabulary teaching strategies can change the learning rate of the same vocabulary. Asyiah (2017) maintained that it is recommended that EFL teachers give their students a variety of vocabulary-building techniques so that they may choose the one that suits them the best and improves their vocabulary. Therefore, teachers should develop, implement and teach different vocabulary teaching strategies for their students. Bintz's study (2011) found that teachers at all grade levels and disciplines should implement techniques in their classrooms for vocabulary teaching and learning across the curriculum. Thus, it was observed that the learning process was impacted by the usage of various strategies.

The storage of newly acquired knowledge occurs through the utilization of both short-term and long-term memory mechanisms within the brain. According to Cowan (2008), one can only think of a concept as being in short-term memory when the neuronal firing pattern, or cell assembly, is active. Short-term memory can be linked to a neuronal firing pattern that represents a particular notion. Newly acquired knowledge is kept in short-term memory. The information that has been learned is later stored in long-term memory**.** According to Cowan (2008), long-term memory is a large repository of information and

a record of past events and each normal individual has access to a rich long-term memory repertoire, albeit one that is not perfect or complete.

The retention of vocabulary is mediated by both short-term and long-term memory. Gathercole et al.'s findings (1997) suggested that the long-term learning of new word sounds is greatly aided by both prior lexical information and phonological short-term memory. The more the newly learned words are repeated, the easier it will be to pass them to long-term memory. According to Sokmen (1997), there is a higher possibility of long-term storage if the encounters with a word are spaced apart by longer periods of time, such as at the end of the class session, then 24 hours later, and finally a week later.

When students learn new words in the lesson, they may show higher success in tests done immediately after that lesson than in tests done a few weeks later. Newly learned words are in short-term memory and the retention may be higher after learning. However, over time, newly learned words can be forgotten if they are not repeated. the results indicated that learners' scores in immediate tests were better than delayed tests. Hashemzadeh (2012) found that in assessments given right away compared to two weeks later, students remembered the words better. In addition, as students learn new words in a language, they are familiar with, vocabulary retention may increase. However, it can be difficult for beginner students to remember the words they encounter for the first time. Gathercole & Masoura's data (2005) about different stages of second language vocabulary acquisition found that temporary memory is a major barrier to early vocabulary acquisition, but long-term memory facilitates vocabulary learning once the learner has attained a high level of phonological familiarity with the language.

While teaching a new language at school, it is important to teach new vocabulary and prepare activities to foster the retention of target vocabulary. Numerous studies have been carried out and a diverse range of approaches have been utilized to enhance the retention of newly acquired vocabulary. Hashemzadeh's study (2012) found that using various exercise types resulted in significantly different vocabulary retention for EFL learners. These activities can be done with activities such as games, reading texts, writing tasks, fill-in-the blank exercises and translation. Teachers can prepare different materials, too.

The use of games in language education is common. Shabaneh & Farrah (2019) stated that playing games can assist pupils to develop their brains, improve their skills, and effectively assimilate information. Games can also be used in teaching vocabulary. Based on Patra et al.'s findings (2022) it can be stated that using games can help students learn English vocabulary. For this reason, vocabulary teaching can be done with various games to increase retention. Taheri (2014) found that utilizing language games significantly improved participants' retention and recall of vocabulary. Despite this, coming up with vocabulary-based assignments that suit every topic can be difficult.

Some of the most common vocabulary teaching activities are fill-in-the-blank and writing activities. Folse (2006) maintained that many educators regard fill-in-the-blank tasks as a superficial or passive use of the language, especially when compared to producing creative phrases. Students may get bored while doing fill-in-the blank activities for vocabulary learning. Likewise, long writing activities may not attract students' attention. Students can complete these vocabulary activities with the help of their dictionaries in the lesson, but in the long term the newly learned vocabulary may not be permanent in the memory.

Another method for teaching vocabulary is translation, both from the native language into the target language and the other way around. Hummel (2010) stated that although students do benefit from actively translating sentences, they are probably more likely to profit from exposure to new vocabulary along with translation equivalents in a copy practice. Over an extended period, various approaches have been employed within educational institutions to facilitate the acquisition of lexicon and enhance its sustenance.

Walia (2012) stated that students mostly rely on grammar rules while writing and translate them from their native tongue, whereas "grammar translation method produces habits that show deciphering rather than reading" when reading. Walia (2012) also stated that learning rules and vocabulary words alone could not produce the intended learning results, according to traditional approaches, which saw language learning as the transmission of knowledge with the aid of a board and rules rather than as a talent.

According to Dong (2016), the students are seated there passively accepting the knowledge as the teacher lectures about the English knowledge and grammar structure of the text or exam skills. However, with the developing age, new teaching techniques are needed.

Teachers should prepare output vocabulary activities that enable students to produce, rather than preparing input-dominant vocabulary activities. Kitajima (2001) examined that if vocabulary exercises that focused on output, as opposed to input, were more effective at helping students remember the target terms. He discovered that under the output condition as opposed to the input-dominant condition, students were more adept at encoding surface-level structures into their memories. By conducting output vocabulary activities, the vocabulary retention can increase.

One of the most crucial language learning resources is reading. Reading while learning a new language allows students to see the use of learned patterns in different ways. According to Cheng & Good (2009), more frequent use of glosses in texts could give L2 readers the support they require to improve their vocabulary and reading abilities so they can become more successful and independent readers. Reading activities can be used to increase vocabulary retention. Talebi & Marzban's study (2015) reported that teaching critical reading strategies is paramount in fostering vocabulary advancement and suggested that formal instruction in these skills can help students become more adept at comprehending and remembering the meanings of unfamiliar words while reading, which will help them increase their vocabulary through reading. Teachers can teach students vocabulary with reading activities and increase vocabulary retention.

2.6 Digital Possibilities in English Teaching

The 21st century is a technology era which rapid changes are experienced. The returns of the 21st century is also seen in education. Geisinger (2016) pointed out that the fundamentals of reading, writing, interpretation, and synthesis are still emphasized in 21st century learning and assessment, but they are also expanded upon. Also, there are some skills that this century has brought. All these features brought by the 21st century have started to be applied in classrooms as well. According to Luckin et at. (2009), changes

are occurring in the forms, representations and various methods of digital communication that are already incorporated into students' daily lives.

Changes in the lives of learners should also be seen in education. In this way, learners are more attracted and the learning environment becomes better. The usage of the English language has significantly increased among a majority of individuals in current times. Castillo-Cuesta (2020) indicated that because communicating in English has developed into one of the most important skills for students to learn, teaching English in the age of globalization requires a lot of work. With the 21st century, technological tools and activities using technology are used in English lessons to improve communication skills of learners.

Web technology is used in all areas of the world. Using this technology in teaching vocabulary in English can increase vocabulary retention. According to Hajebi et al.' findings (2018), by including web-based training in language learning classrooms, learners' perceptions have improved. So, technology can be useful for teaching English.

2.6.1 Gamification

Children develop their imaginations by playing games and many things can be taught through games. Games are often used in many sectors because of their educational nature. Koivisto & Hamari (2019) asserted that gamification has significantly advanced in the twenty-first century, permeating a variety of fields including technology, culture, society, healthcare, and economics. Games might aim to teach different things. According to Basten (2017), common game elements is given below.

Table 2. Common Game Elements (Basten, 2017)

Game element	Definition
Feedback	Immediate notification that keeps users constantly aware of progress or failures
Goals	Activity goals that are adapted as challenges for the user
Badges	Optional rewards and goals outside the scope of a service's core activities
Point System	Reward for completing actions (that is, a numeric value that's added to the total points)
Leaderboard	Tracking and displaying desired actions to drive desired behavior through competition
User Levels	Indication of the user's proficiency in the overall gaming experience over time

Gamification is also used in English education. According to Deterding et al. (2011), the application of game elements like scoring, challenge, and achievement to learning objectives is known as gamification in education and it is done to encourage and engage students. Using these components can make English education much more fun and instructive.

According to Dehganzadeh & Dehganzadeh (2020), gamified learning a foreign language can boost motivation and engagement. Consequently, the implementation of such measures can prove advantageous for students, as it can lead to heightened levels of motivation and engagement within the educational setting, especially in instances where compulsory attendance policies are not in place. The adoption of enhanced motivation strategies has the potential to make the academic sphere more interesting for students. Alceide-Martinez & Taillefer's study (2022) demonstrated that gamification has a notable effect on enhancing student motivation and improving the quality of learning in the classroom.

Since technology is such an important part of education in this digital era, gamification can be used with virtual reality in language teaching. Reitz et al. (2019) found that VR

games improved the students' communication abilities by invoking a lot of speech and high-quality verbal output. Similarly, Pinto et al. (2021) highlighted the possibility of using VR technologies in conjunction with gaming techniques to aid and promote the study of a second language.

2.6.2 Web 2.0 tools

One of the benefits of the technology is Web 2.0 tools. Usluel & Mazman (2009) claimed that users' active involvement in the process of content generation is the distinguishing feature of these Web 2.0 tools. It was asserted by the authors that social networks, wikis, podcasts, and blogs are among the most widely utilized Web 2.0 tools. The integration of Web 2.0 tools in educational settings can yield advantageous outcomes. According to Konstantinidis et al. (2013), even though they weren't created with education in mind, Web 2.0 tools present special, previously unattainable opportunities to alter the nature of teaching and learning experiences. This helps to address a number of current issues in education, including student engagement, authentic learning, and autonomy in learning.

Web 2.0 tools are also used for English education, which is increasing rapidly in the 21st century. Many researchers found positive result of using Web 2.0 tools in English education. Basal & Aytan’s study (2014) found that Web 2.0 technologies can foster a more student-centered environment for language learning since they let learners develop their own information rather than just absorb it. In student-centered teaching environments, learning becomes more enjoyable. Halim and Hasim (2019) maintained that integrating Web 2.0 technology in English lessons offers following benefits:

- Increasing learners’ learning engagement;
- Enhancing learners’ writing skills;
- Providing a more comfortable and convenient learning environment;
- Offering visual data as a learning support to aid learning process;
- Enhancing social skills among learners;
- Promotes peer coaching;
- Promotes communication inside and outside classroom;

• Escalate learners' enthusiasm and self-confidence to learn ESL skills (Halim & Hasim, 2019, p. 23)."

One of the most popular Web 2.0 resources for language learning is YouTube. There are various educational channels to teach English such as LearnEnglishInVr to teach English. Using these channels and videos can motivate students and promote learning. Sakkir et al (2020) found that the large number of students had favorable opinions about and were eager to use YouTube in the EFL classroom. Also, students can learn English outside of the school thanks to YouTube and become autonomous learners. Harlinda (2019) indicated that utilizing YouTube to learn English helped students become more independent learners by strengthening their language abilities.

2.7 Virtual Reality

If virtual reality is broken down into words and their meanings are taken into account; according to Asaad (2021), the ability of something without a true physical presence to portray something realistic and palpable is what gave rise to the word "virtual" in the fourteenth century. This phrase has persisted in language to this day. The concept of reality pertains to the entirety of existence within the cosmos. According to Howgego (2020), "everything that there is" can be summed up as the vast and confusing idea known as "reality". A new concept called "virtual reality" has emerged as a result of the combination of the real world and the virtual one. According to Zheng et al. (1998), virtual reality (VR) is a cutting-edge kind of human-computer interaction that creates a realistic environment that users can move around in, view from various perspectives, reach into, grab, and change. In virtual reality participants may feel like they are in a different realm.

The origin of VR is older than one might think. The origin of the rapidly developing VR has existed since the 1800s. The first stereoscope, which projected a single image using two mirrors, was created in 1838. The Franklin Institute, 2022 stated that later on, that evolved into the View-Master, which was granted a patent in 1939 and is being manufactured today. In the following years, there have been new developments in virtual reality. Martirosov & Kopecek (2017) stated that back in the early 1950s, the Sensorama,

a multisensory simulator with wind and aroma creation, vibratory feeling, and 3D projection, was created at the time by Morton Heilig. This development took virtual reality studies one step further. Lum, et al. (2020) indicated the figure of patent for immersive VR system by Heilig as following.

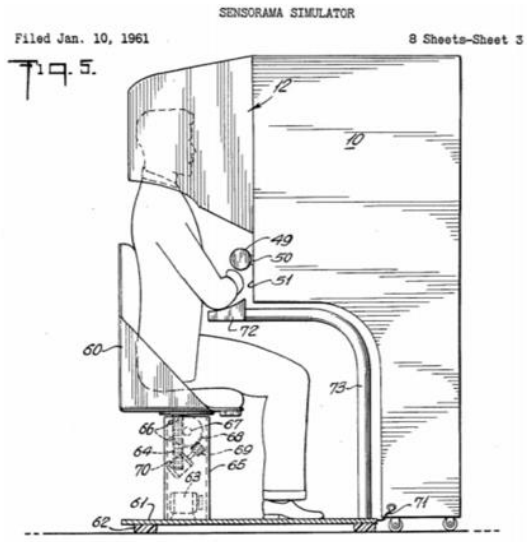


Figure 1. Patent for Immersive VR System by Heilig (Lum, et al., 2020**)**

Zheng, et al. (1998) stated that the term "virtual reality" is attributed to Jaron Lanier, the founder of VPL Research. There is another term called virtuality continuum, it is a continuous scale that alternates between the all-virtual virtuality and the all-real reality. According to Milgram (1994), as demonstrated in Figure 2, the concept of a "virtuality continuum" refers to the mixing of classes of objects exhibited in any particular display condition, with genuine settings being depicted at one end of the continuum and virtual environments at the other. The idea of a virtual continuum also incorporates virtual reality. According to Icten & Bal (2017), one of these ideas is virtual reality, which may be described as a setting found in three-dimensional computer games where the user's connection to the outside world fully vanishes.

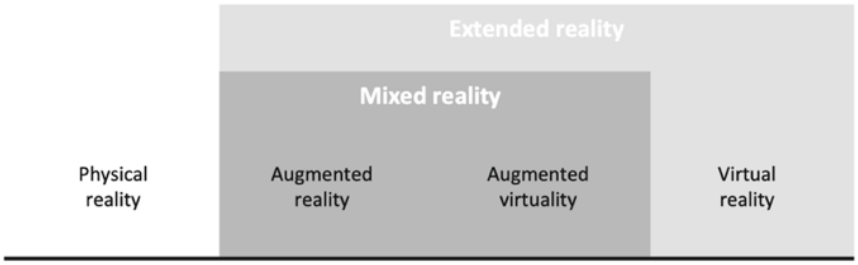


Figure 2. Simplified Representation of a "Virtuality Continuum" (Milgram, 1994)

There exist distinct varieties of virtual reality. According to AR VR (2022) three primary categories of virtual environments are comprising a non-immersive virtual environment, an immersive virtual environment, and augmented reality. The usage areas of these types vary. Stars & Strikes (2020) explained that non-immersive virtual reality is a sort of virtual reality where people can control some characters or activities within the experience and interact with a virtual environment, usually through a computer, but the virtual environment is not directly engaging with people. Some computer games can be good examples of non-immersive virtual reality. Because in some computer games, features can be controlled and the game may be affected. According to Wigmore (2016), immersive virtual reality (immersive VR) is the presentation of a synthetic environment that takes the place of the user's actual surroundings with sufficient persuasion for the user to be able to suspend their distrust and fully interact with the produced environment. Augmented reality is a dynamic experience of a real-world environment. Berryman (2012) described augmented reality as a technology that overlays digital data over real-world objects or settings. Put differently, augmented reality assimilates the physical and computer-generated realms. Objects can be simulated and interacted with in the real world.

2.7.1 Virtual reality goggles

Virtual reality goggle is a head-mounted technological device for experiencing the virtual reality environment. Asaad (2021) explained that it resembles a mask or a helmet and has one or two tiny screens on the interior that can display monochromatic views or play stereo audio. People can simultaneously see and hear the virtual world in this way. Asaad (2021) further asserted that users of the VR goggles can see what the software shows

them and perceive objects in three dimensions; alternatively, as users may see and hear at the same time, the gadget might work as a full headcover. VR goggles can be worn and used easily.

While some VR goggles can connect to the computer via Bluetooth and open the desired 3D image, a smartphone is placed on some VR goggles and the desired 3D image is opened from the smartphone. The 3D image is split into two parts. Individuals see and hear the desired image by wearing VR goggles on their heads. VR goggles have increasingly found their application in a host of domains, notable among which are the gaming and educational sectors. According to Lin et al. (2022), the use of wearable googles is given below.



Figure 3. Use of Wearable Goggles (Lin et al., 2022)

2.8 Virtual Reality in Education

For years, a variety of methods, strategies, and approaches have been employed in teaching and different materials have been created. Virtual reality, which has increased in popularity recently and provides different opportunities, has also started to be integrated in education. Elmqaddem (2019) asserted that when used properly, these technologies can improve current educational settings and improve learning chances for pupils. Thanks to enriched learning environments, students can enjoy the learning process more.

VR allows to experience different environments even when people are not there. Freina & Ots' study (2015) found that virtual reality (VR) could offer benefits as early as middle school since it enables learners to physically explore concepts that are not accessible in reality, which improves their understanding and memorization. Students can better understand the topic they learn by seeing real-life examples thanks to VR. For instance,

if the subject is wild animals, they can better understand the species and their habitats by walking in a jungle thanks to VR goggles. Thus, they will actively participate in the learning process. Hedberg & Alexander (1994) believed that the learner cannot play a passive role in the interaction due to the interface's inherent three-dimensionality and interaction with the context. Due to the aforementioned advantages of virtual reality technology, it has been increasingly leveraged for educational purposes.

Many researchers have found positive results of using VR in education. Izard et al. (2017) stated that this kind of technology spatial vision resource will unquestionably help to enhance medical training procedures. Since virtual reality is being used in medical education, students can get to know the human body, diseases and organisms more closely. Hussein & Natterdal (2015) discovered in their study that the utilization of VR offers distinct advantages by providing a comprehensive, immersive, and visual representation of the subject matter. In the context of studying astronomy, for instance, VR technology allows individuals to tangibly perceive and appreciate the physical dimensions and proportions of planets. Under normal circumstances, students cannot evaluate planets by seeing them realistically in 3D. But thanks to VR, this has become possible. Hussein & Natterdal (2015) also stated that when used in the appropriate context, both teachers and students can benefit greatly from using virtual reality. The unique way that virtual experiences deliver information cannot be replicated by other types of tools used in education today. According to Pantelidis (2009), model for determining when to use virtual reality in education and training courses is given below.

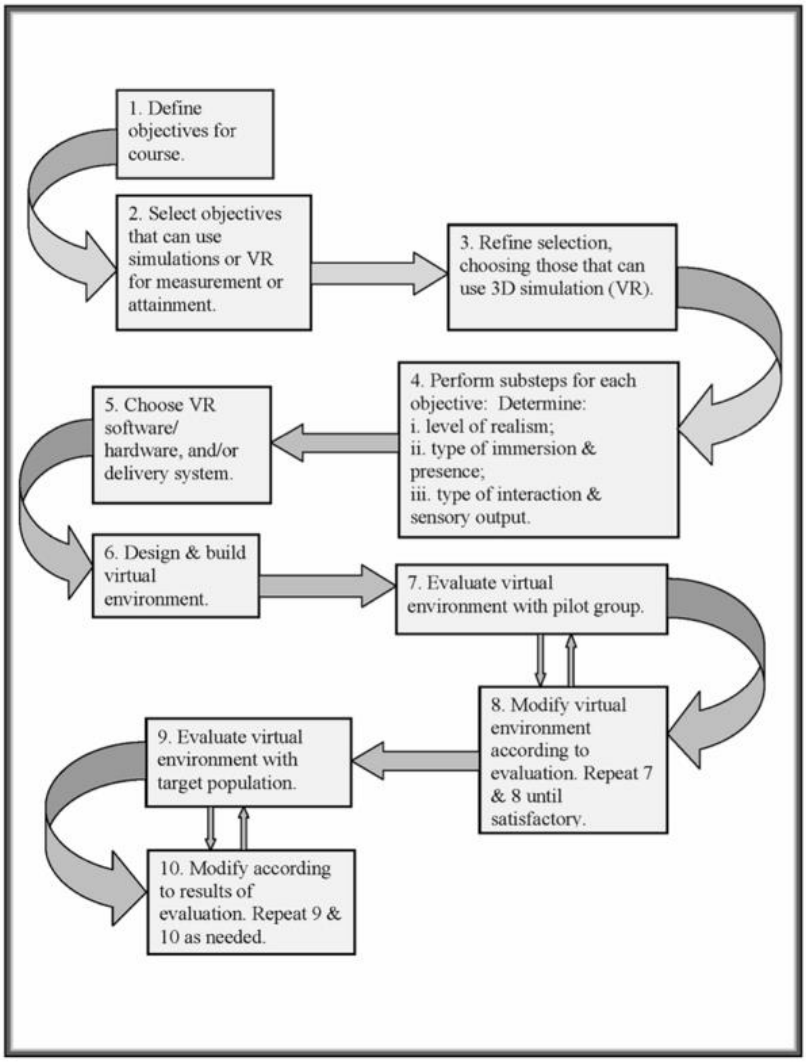


Figure 4. Model For Determining When to Use Virtual Reality in Education and Training Courses (Pantelidis, 2009)

Owing to its many benefits, VR technology may start to take its place in education more in the future. Hu-Au & Lee (2017) stated that it can push the limits of the conventional classroom to be interesting, inventive, and attentive to the requirements of the student. It may be more advantageous for students to learn by seeing places that they normally cannot reach, rather than using materials that are in the classroom environment at that time in the traditional classroom. Nemec et al. (2017) maintained that it also presents significant educational opportunities because it makes it possible to visualize both actual and made-up settings, giving students access to otherwise inaccessible locations. While learning a language, VR may serve as a valuable tool for investigating the cultural aspects

of the target language. Furthermore, this technology enables students to benefit from opportunities such as encountering the learned environments in three-dimensional.

The integration of VR in education can increase students' motivation for many reasons. Harris & Reid (2005) maintained that the utilization of VR play has been found to engender motivation and exhibits promising potential as an efficacious tool. Doing activities with VR in the lesson can be interesting for students at different levels. Huang et al. (2021) suggested that learning was encouraged, engaged, and supported at both moderate and higher degrees of immersion. Students can be more productive in the classroom thanks to VR. Hsu (2020) claimed that VR-assisted instruction increases student effectiveness and motivation. Mei & Sheng (2011) discovered that VR technology boosts the interaction and immersion of course materials, creating a compelling, immersive setting that can pique learners' interest and motivation. Different contents prepared with VR can increase the student's curiosity. Thanks to increased curiosity, student motivation can increase. Consequently, integrating VR in education can increase student motivation and engagement.

2.8.1 Virtual reality in language teaching

Language is used to understand and express what is happening around in real life. In everyday life, language plays a crucial role. In every context, it is used for communication. Many methods have been put forward for language teaching, but few of them deal with the method of acquiring the language naturally as in the mother language. According to Ökmen and Kilic (2016), improvements in learning theories and psychology have had an impact on how methods and approaches have evolved over time. One of the ongoing changes in education is the integration of new technologies into education. Using VR technology, among the array of emergent technologies, has the potential to yield advantageous outcomes in the field of language education. Lin & Lan (2015) stated that language learning in the advent of wireless communication and multimedia settings has led to substantial progress and widespread usage of VR environments, which has engendered noteworthy attention in various fields.

There are many benefits to using VR in language lessons. Parmaxi (2020) demonstrated that VR offers a wide range of advantages, including increased authenticity in the evaluation of the target language, interaction, motivation, task engagement, vocabulary development, and a reduction in levels of foreign language anxiety. Since VR offers different real-life like visuals, the 3D visuals prepared are authentic. Park (2018) suggested that using a virtual world with simulated tasks and an immersive interface could give language learners more genuine opportunities to carry out the desired tasks and foster both strategic and linguistic competence.

In language classes, students are often anxious. Using virtual reality in language lessons can relate the learning environment to real life and reduce the stress of students. Huang et al.'s 2021 study found that VR technology help students feel more at ease by concealing their identities and creating a relaxing environment. Thanks to virtual reality, students can experience a situation or place with the perception of reality without traveling. This opportunity makes the anxiety lower in the lesson environment. Melchor-Couto (2016) stated that virtual worlds have been referred to as low anxiety environments, and he discovered that certain students who participated in them expressed enhanced self-confidence and decreased anxiousness. A reduction in anxiety levels has the potential to positively impact the motivation of students.

Cultivating knowledge of the culture associated with the language one is endeavoring to acquire is imperative. Thanks to VR, new cultural elements can also be learned. Kessler (2018) maintained that in order to practice tasks that are appropriate for that culture, students can use VR to be transported into an immersive experience of the target language culture. This allows them to practice in ways that would otherwise be only possible by traveling. Thanks to VR, students can experience the target language's culture from the classroom environment and thus learn more in the target language. Berti (2021) believed that VR has enormous potential for FL acquisition and for teaching about different cultures because these fully immersive experiences allow students to navigate real-world settings, pay consideration to what interface them, and lock in with the target culture exterior of the classroom.

Rich learning environments are created as images are accessed from different environments thanks to virtual reality. Language acquisition can become easier in rich learning environments. Chen et. al.'s study's (2020) findings confirmed the potential of an immersive and multimedia-rich learning environment for language acquisition is made possible by VR technology. They also found that watching VR movies can help with the in-depth processing of word usage in context and can strengthen the memory of the target terms, both of which are important for acquiring English vocabulary. As teaching environments become richer and students' learning increases, so does their academic achievement. Acar & Cavas's study (2020) obtained the following:

> VR-Based English teaching had positive effects on the students' academic achievement. The results showed that the students' cognitive skills improved especially at high levels. In the virtual reality environment, students were responsible for their own English learning. The English texts that appear on the VR screens especially during their visits to the planets in an environment close to the real images contributed to the students' improvement of reading and writing skills (Acar, Cavas, 2020, p. 31).

The use of VR tools in the lesson can provide convenience for teachers as well as students. VR tools provide teachers with rich materials while teaching the lesson. Kaya's study (2019) found that the majority of teachers who participated in interviews said they would prefer to utilize virtual reality applications at the start of the session to engage students and during the presentation of the material to help students understand it. Language teachers may think that their students can be better motivated and learn through VR. According to Peixoto et al. (2019), foreign language teachers believe that this technology can inspire students and accelerate their learning curves for foreign or second language listening.

2.9 Brain-based Learning and Virtual Reality in Vocabulary Teaching

By harnessing the power of brain-based learning, vocabulary teaching can be significantly impacted as this approach is in line with the brain's natural means of language acquisition and memory retention. Salem's (2017) findings showed that using brain-based learning

approach to teach vocabulary increased vocabulary retention as well as increasing intrinsic and extrinsic motivation triggered by the activities used. Incorporating approaches that focus on the brain into teaching vocabulary can make the learning process more efficient, enjoyable, and easier to recall. By capitalizing on the brain's native aptitude for language acquisition and memory, teachers can guide students in assembling a larger and more extensive vocabulary. Gozuyesil and Dikici (2014) stated that using brain-based learning led to greater academic success than using traditional teaching methods.

Integrating virtual reality into vocabulary teaching can prove to be an exceedingly potent approach to enrich the learning that is based on the brain. The creation of immersive and interactive experiences by the virtual reality technology serves to engage numerous senses and encourages the practice of active learning, thereby aligning perfectly with the natural processes of the brain. Ciftpınar (2012) maintained that using brain-based learning fosters a highly productive learning environment and aids students in developing long-term memory for particular linguistic units, particularly vocabulary. In addition, in virtual reality experience more senses are engaged. It is because students wear the VR goggles, see and listen to the real-life like 3D materials and move around the classroom. Kenwright (2019) stated that virtual reality has the potential to affect all of our senses. Virtual reality provides learners with the opportunity to encounter new vocabulary in a multisensory environment. They can see, hear, and on occasion, tactually perceive or engage with the objects or ideas depicted by the words, thereby establishing more robust neural connections for memory retention.

Parsons & Mitchell pointed out that virtual environments may promote the mental simulation of social interactions and possibly offer more insight into the human mind. So, VR scenarios can present new vocabulary in meaningful contexts, making it easier for learners to understand and remember the words. As an illustration, learners may immerse themselves in a virtual marketplace and engage in dialogue with vendors, employing the specific lexicon associated with the acquisition and disposal of commodities. Moreover, virtual reality has the capacity to elicit emotional responses and instill a profound sense of presence. North & North (2016) explained the sense of presence, a well-known aspect of virtual reality, as a sense of "being there". When learners experience emotional

engagement, their cognitive faculties become more receptive to the process of learning, thereby enhancing their ability to remember the vocabulary.

Virtual reality, by immersing learners in a simulated environment, has the potential to promote sustained focus and mitigate cognitive exhaustion by incorporating some physical movements. Thus, kinesthetic learning is supported. Vazquez et al. (2018) supported that he utilization of virtual reality has the potential to significantly influence the acquisition of language, primarily through the incorporation and utilization of kinesthetic elements. Furthermore, some virtual reality applications have the ability to facilitate collaborative learning, which permits students to engage with each other in a simulated environment. Shih & Yang (2008) revealed that incorporating VR technology into educational settings has the potential to foster positive attitudes among students and enhance interactive learning experiences.

2.10 Vocabulary Retention and Virtual Reality

Virtual reality is being used more and more often across different sectors. Virtual reality provides people with an artificial world, creating a perception as if they are there and allowing them to experience environments that they cannot reach. Thus, people experience virtual reality using many sense organs. Calli, et al. (2020) stated that the sense of hearing and sight is already broadly used in virtual reality. At the same time, people can experience different emotions by detaching from reality and feeling themselves in the environment they experience with virtual reality. For example, a person may feel scared if they see something that contains elements of fear, get excited if they ride a rollercoaster, or feel peaceful if they see a happy family picture.

Thanks to virtual reality, people experience different environments. In other words, they learn by experiencing the environment. Since many sense organs and emotions are involved in learning by experience, it can provide permanent learning. Ord (2012) maintained that participation in the learning process directly benefits learning. Language is also a tool used in real life, not just books and dictionaries. So, learning can be more permanent if students learn the target language by doing real-life activities integrated with VR.

An essential element in language acquisition is the enhancement of vocabulary, and using VR to learn vocabulary will help students remember it for longer. Using virtual reality in English vocabulary teaching can produce positive results. Vazquez et al. (2018) found that using virtual reality supports the learning of vocabulary in the target language. Students of different levels can learn language through virtual reality and it can increase the retention of the learned vocabulary. Madini and Alshaikhi's data (2017) demonstrated that the postgraduate students' ability to recall ESP terminology and raise their level of competency was actually boosted by virtual reality videos.

The acquisition of vocabulary by any instructional approach can result in successful retention immediately post-instruction; however, eventual decay in recall may ensue. Thanks to VR, long-term vocabulary retention can be high. According to Palmeira et al.'s findings (2020), as a result of being able to view and engage with virtual objects, VR helps language learners retain words more effectively over time. Students can also see how the word is used in context by seeing the prepared 3D materials with VR. Tai et al.'s study (2020) demonstrated that the VR app helped EFL students learn and remember words' meanings. So, long-term vocabulary retention is impacted favorably by VR.

Vocabulary retention can be increased thanks to VR integrated vocabulary activities. In this way, students' vocabulary knowledge expands. Li et al. (2022) found that students' incidental vocabulary acquisition was improved, and their participation in the cognitive, behavioral, and social aspects of learning was fostered. Additionally, the VR experience's vocabulary input and the subsequent reflection, abstract thinking, and experimentation all helped to improve the output of vocabulary. Using virtual reality activities can aid in the transfer of words from a transient memory state to a more durable one. According to Koçbuğ (2018), the use of VR technologies during training facilitated the transfer of information from short-term memory to long-term memory among students, thereby increased the retention of the target language. The cause of this might be to make students use the common language to have a real-life experience thanks to virtual reality. Koçbuğ (2018) also indicated that students showed a favorable attitude toward instruction facilitated by VR equipment.

Since language is a real-life tool, it can be helpful to use real-life activities for teaching vocabulary. Freina & Ott's study (2015) demonstrated the potential of virtual reality to play a key part in activities by enabling the visualization and simulation of occurrences that are not perceptible in real life. Given that it allows learning through experience, virtual reality can be used in vocabulary teaching activities and can improve vocabulary retention. According to Albayrak et al. (2023), VR environment can enhance vocabulary retention. So, using VR in language lessons can have positive results. Koçbuğ's study (2018) found that the VR tools employed in the study have a positive effect on students' learning.

CHAPTER 3. METHODOLOGY

This study is based on research on the impacts of using VR goggles in English vocabulary teaching on vocabulary learning, long-term retention, and students' vocabulary learning motivation. The following focuses on describing the methodology used to find the right answers to research questions.

3.1 Research Questions

There are not many studies investigating the use of VR as a tool to increase the retention of vocabulary in educational institutions that teach English as a foreign language. The present study endeavors to ascertain whether the utilization of virtual reality technology in English language classes leads to heightened retention of new vocabulary over both the short and extended time intervals. This study was led by two research questions which can be stated as the following:

1. Does using VR goggles as an English language vocabulary teaching material have any impact on students' vocabulary retention?

2. What are students' views about using VR goggles to enhance their English language vocabulary learning motivation?

3.2 Hypotheses

This research argues that both short- and long-term vocabulary retention are improved by engaging in VR integrated teaching activities. The data will be used to investigate the following hypotheses**:**

1. Using VR goggles integrated vocabulary teaching activities increases university preparatory students' English language vocabulary retention in short and long term.

2. Using VR goggles integrated vocabulary teaching activities increases university preparatory students' English language vocabulary learning motivation.

3.3 Research Design

In recent years, research with mixed designs have increased in the literature. On the main basis, research broadly classified as quantitative and qualitative. Quantitative data may not always be sufficient to solve problems by itself, and even the real truth on many issues can be reached through qualitative analysis. Many publications have been made to explain research types. One of the most important publications in this field is Creswell's (2009) "Research Design: Qualitative, Quantitative and Mixed Methods Approaches". Creswell (2009) asserted that it is common to emphasize the use of words rather than numbers or the use of "closed-ended questions (quantitative hypotheses) rather than open-ended questions (qualitative interview questions)" in qualitative research to distinguish it from quantitative research. Some may contain information derived from both quantitative and qualitative designs. In this case, mixed methods might be used. According to Creswell (2009), mixed methods research refers to an investigative approach that integrates or links together qualitative and quantitative methodologies.

Mixed methods research allows collecting different types of data. Henceforth, the problem can be evaluated through various methodologies, and the outcomes can be scrutinized through diverse analytical approaches. Almaki (2016) stated that it makes sense to compile data from several sources using various techniques that combine to generate a successful design. Examining a problem deeply by conducting both quantitative and qualitative research can yield more authentic results, especially in the field of social sciences.

The current research employed the mixed method sequential explanatory design. Ivankova et al. (2006) explained that sequential explanatory design entails gathering and analyzing data in two phases, quantitative and qualitative, within a single study. Dörnyei (2007) pointed out that by describing broad trends in the data and the overall dispersion of the scores, the mixed-methods study design facilitates in the summary of findings. This research was conducted to test the impact and importance of implementing VR goggles integrated vocabulary teaching activities in preparatory classes to increase students' English language vocabulary retention as well as to get their opinions and views on VR goggles integrated vocabulary teaching activities on vocabulary learning motivation.

Quantitative data was collected with the results of the Pre-test, 8 quizzes, revision test-I, revision test-II and post-test. At the end of 15 weeks, the opinions of the focus group chosen from experimental group about VR goggles integrated vocabulary teaching activities was obtained by semi-structured interview questions. The answers were recorded and then converted into written text and discourse analysis was done. So, qualitative data was collected to understand the participants' views and reflections on their personal experiences about VR activities. In this study, tests and semi-structured interviews were applied to the participants in order to learn their standpoints of the effects of the VR goggles integrated vocabulary teaching activities on both their English vocabulary retention and their vocabulary learning motivation.

3.4 Participants

The participants of this mixed method research are university students at a foundational university in Istanbul who are enrolled in the English preparatory program. 47 students voluntarily participated in the research from 2 different preparatory classes, where the researcher was an English teacher. The average age was 18. The class levels were at a beginner level. The research was executed on two distinct groups referred to as the experimental and the control group. These two classes were the classes assigned to the researcher by the administration to teach English during that academic year. Convenience sampling was applied as a result. The method of non-probability sampling is convenience sampling. According to Taherdoost (2016), convenience sampling involves choosing individuals who are frequently and easily accessible.

Based on these, this table illustrates participants for this study:

Table 3. Participants of the Study

Group	*Level*	*Number of participants*	*Females*	*Males*
Experimental group	Beginner	25	15	10
Control group	Beginner	22	12	10

3.5 Data Collection

In this section, data collection tools and the procedure followed to collect data are explained.

3.5.1 Data collection tools

First, the Ethics Committee gave the required approvals for the use of VR goggles, tests, quizzes, and semi-structured interviews. Since the participants were over the age of 18, they signed the informed consent form confirming that they voluntarily participated in the study. At the outset of the research, a pre-test assessing the target vocabulary instructed throughout the duration of the research was administered to both groups. During 8 weeks, 10 words were thought to experimental group via VR goggles integrated vocabulary teaching activities, control group via using traditional methods such as power-point and flashcards. Every week, at the end of each lesson a quiz was done. In total 8 quizzes were done by both groups.

At 5^{th} week revision test-I applied at 9^{th} week revision test-II applied. After 8 weeks, no more activities and repetition were done including target words. At the end of the 15 weeks, a post-test was done by both groups. Pre-test, revision-test I, revision test-II and 8 quizzes were done by students at the university, in their classrooms, and during class time. However, at the end of the research all universities in Turkey started giving online education because of the earthquake. As a result of this post-test is done online via Zoom. Students opened their camera and they had 40 minutes to do the test. They sent their post-test via e-mail to the researcher as soon as the exam time is over.

In accordance with the research protocol, the second stage involved the administration of semi-structured interviews to the focus group, which was carried out at the end of the 15th week. A focus group formed consisting of 9 students from the experimental group. The focus group consisted of 3 students with the highest score, 3 students with the middle score, and 3 students with the lowest score from the post-test. Because of the online education, interviews are done on Zoom. Semi-structured interview questions were asked to the focus group students at online meeting one by one to get their opinions on VR goggles integrated vocabulary teaching activities. The students who participated in the

study did so voluntarily and were informed about the research prior to before the application.

The following semi-structured interview questions were asked to 9 focus group students chosen from experimental group in their native language.

1. What are your general thoughts on teaching vocabulary with virtual reality integrated activities?
2. Can you compare the vocabulary teaching activities integrated with virtual reality and the vocabulary teaching activities that you did in the foreign language education process in the previous years?
3. What do you think about the effects of virtual reality integrated activities on your English vocabulary learning?

3.5.2 Data collection procedure

Various activities were used to teach the target vocabulary over the course of the fifteen-week study. Each activity's goal was to boost students' interest for acquiring vocabulary during the lesson and their ability to retain it. Target vocabulary were selected from a YouTube channel called LearnEnglishInVr. 10 target words were selected from each selected 3D video. The 80 target words chosen for 8 weeks was taught to the control group using PowerPoint and flashcards using the traditional methods without using 3D videos and VR goggles; to the experimental group using VR goggles. IPA symbols of the target words' pronunciation was taught. The YouTube channel which target vocabulary has been chosen and example of teaching IPA symbols are given below.

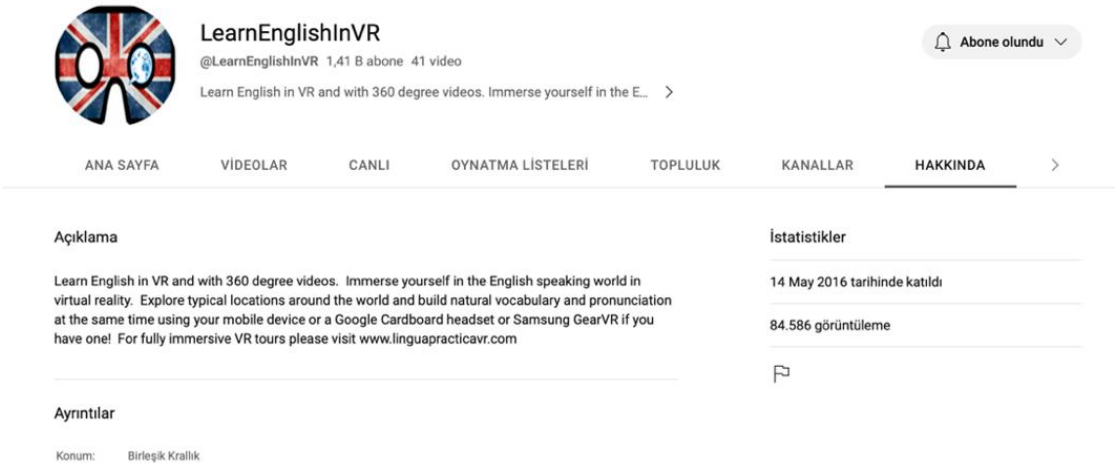


Figure 5. LearnEnglisgInVr YouTube Channel

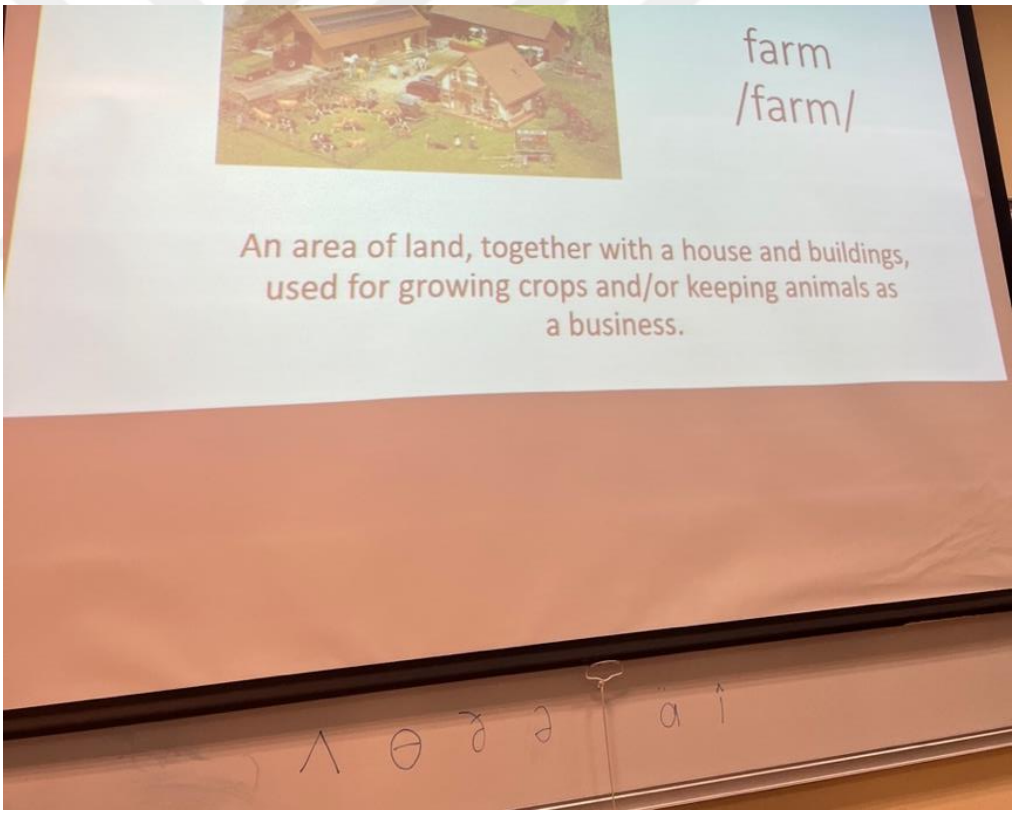


Figure 6. Teaching IPA Symbols Process

The first week of the research started on 21 November 2022. Earlier in the week, a pre-test was conducted to assess the current vocabulary of participants in the two classes of

target words taught throughout the research. Pre-test includes different types of questions formed with 80 target vocabulary. Different question types have been created to evaluate the pronunciation, usage, form and meaning of the target vocabulary.

On 23 November, vocabulary teaching process was started. The control group was instructed on the acquisition of 10 designated words via power-point slides and flashcards each week during eight weeks. During eight week a quiz was done after each lesson. Each week in control group's lesson the teacher read the words and students heard the pronunciation. Teacher showed the words' written form in IPA and taught IPA symbols which are in the words. The teacher conducted different activities using target words in control group's lesson such as writing sentences.

The experimental group was instructed using the identical set of 10 target words each week via VR integrated vocabulary teaching acitivies. In each lesson, the teacher formed pairs, then gave the VR goggles and video links. Students stood up, wore the VR goggles and watched the 3D videos with their partner one by one. They walked in the classroom too see the content in 3D videos. They explored the VR environment and learned the target words. After that they listed the words they remembered. Then they explained what they saw and understood from the video to their partner. The teacher taught IPA symbols to practice pronunciation. Activities such as making poster using target words conducted. After each lesson a quiz was done to assess the short-term retention of target words.

Vocabulary teaching process was finished at 8th week. Revision test-II was conducted on 18th January at nineth week. Between the weeks 9 and 15 any activity including target vocabulary wasn't done. Normal curriculum belongs to the university was taught. Universities started giving online education because of the earthquake. As a result of this, post-test was conducted online on Zoom on 6th of March at 15th week. Semi-structured interviews were carried out online to the focus group on 21st of March. The students were informed and voice recording was taken during interviews.



Figure 7. The Picture of The First Power-Point Slide



Figure 8. The Flashcards For The First Lesson Of Week One

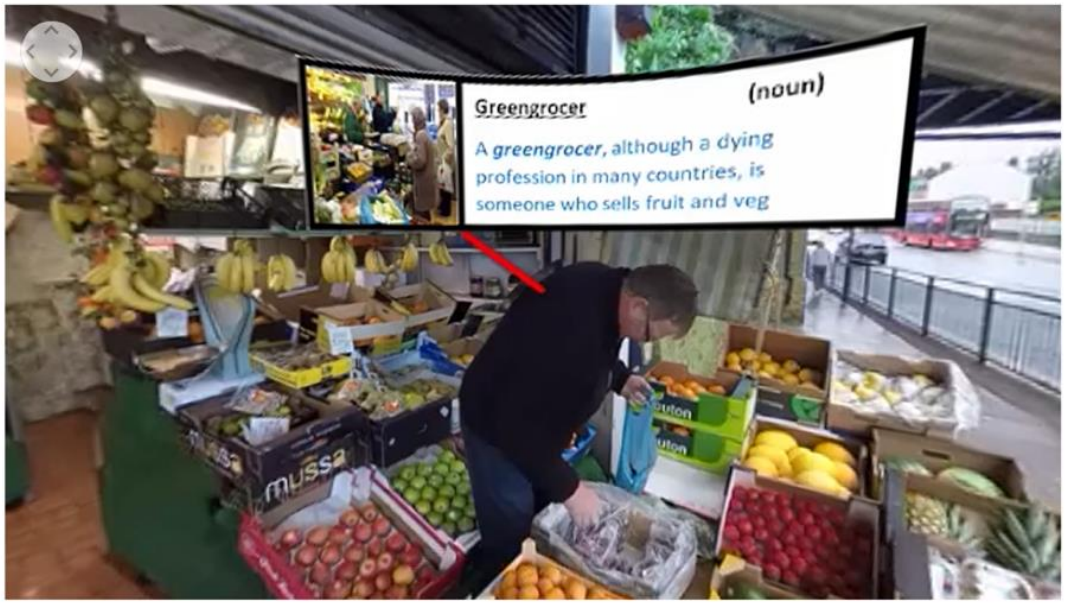


Figure 9. The VR 3D Youtube Video of Week One

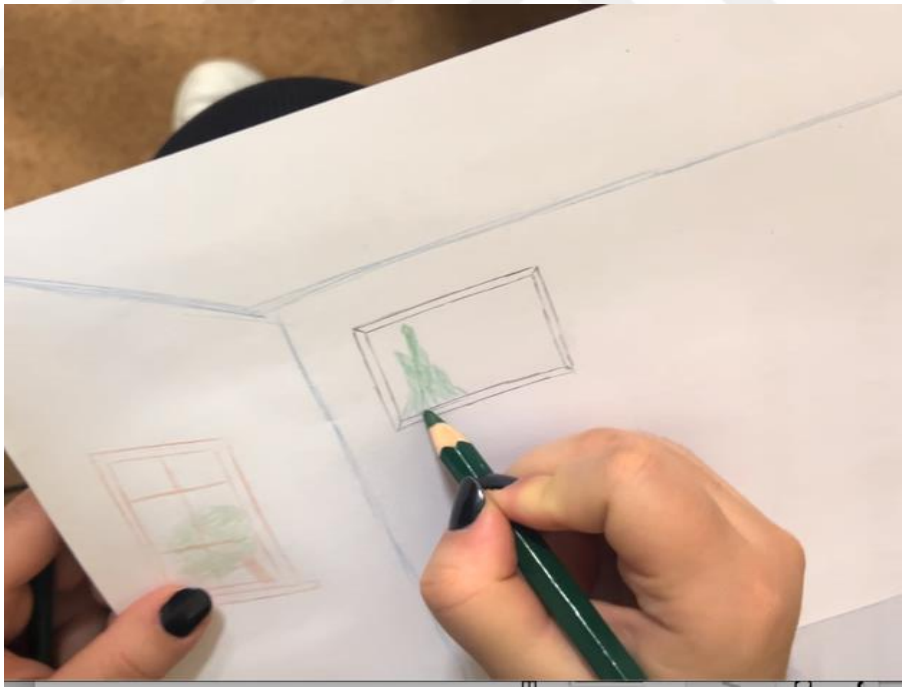
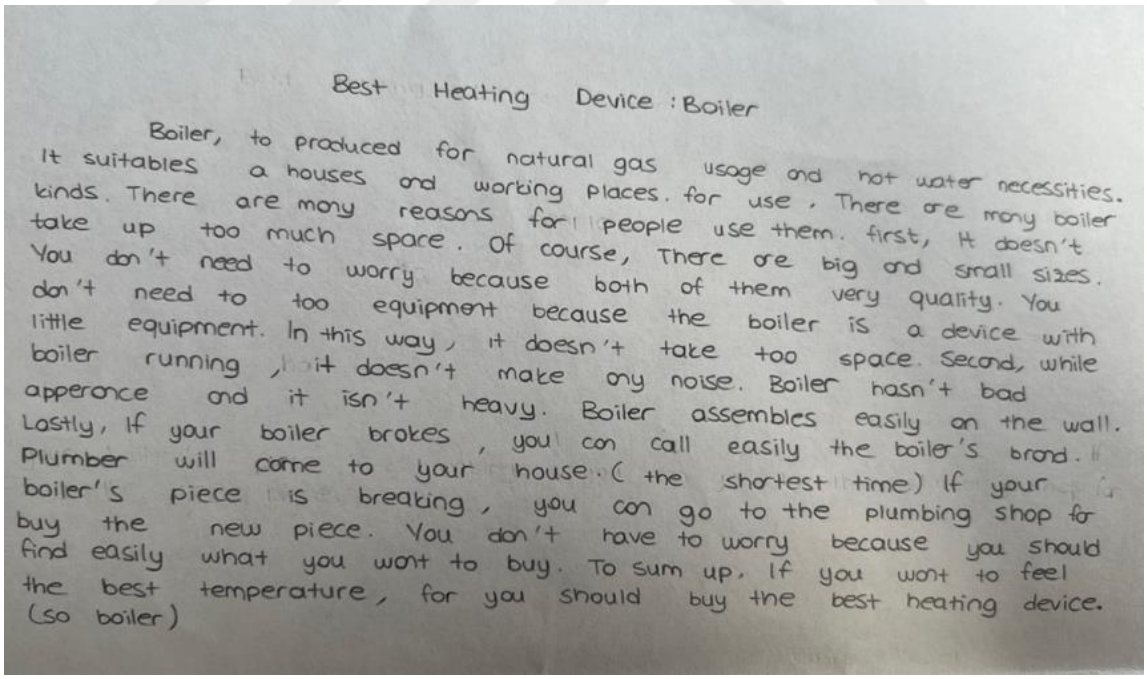


Figure 10. Students Poster Making Process



Figure 11. The Posters of Some Pairs



Best Heating Device : Boiler

Boiler, to produced for natural gas usage and hot water necessities. It suitables a houses and working places. for use, There are many boiler kinds. There are many reasons for people use them. first, It doesn't take up too much space. Of course, There are big and small sizes. You don't need to worry because both of them very quality. You don't need to too equipment because the boiler is a device with little equipment. In this way, it doesn't take too space. Second, while boiler running, it doesn't make any noise. Boiler hasn't bad apperance and it isn't heavy. Boiler assembles easily on the wall. Lastly, If your boiler brokes, you can call easily the boiler's brand. Plumber will come to your house. (the shortest time) If your boiler's piece is breaking, you can go to the plumbing shop for buy the new piece. You don't have to worry because you should find easily what you wont to buy. To sum up, If you wont to feel the best temperature, for you should buy the best heating device. (so boiler)

Figure 12. Example of a Beginner Level Student's Paragraph

3.6 Data Analysis Procedure

All tests and quizzes applied to the two groups were the same. The names of the students were not utilized in the research; instead, they were identified by placing a number next to each student's name and categorizing as Control Student 1, (CS1), and as CS2, CS3.....CS22 and Experimental Student 1, (ES1). ES2, ES3….ES25.

Upon consideration of previous research studies, the optimal sample size was determined utilizing the calculation of the arithmetic mean and standard deviation across the groups. It was concluded that for the control group n=24 and the experimental group n=25, in total N=49 samples would be sufficient. The sample calculation was made using the GPOWER application. In order to determine if any distinctions existed between the control and experimental groups of students as a result of the pre-test administered at the outset of the research, an independent sample t-test was employed. In order to ascertain any variations between the pre-test and post-test, an independent sample t-test was employed, owing to the lack of any significant statistical differences exhibited in the pre-test between experimental and control group students. Moreover, the advancement achieved during the course of the pre-test and post-test evaluations in both the control and experimental groups was assessed utilizing the dependent sample t-test. This research involved conducting frequency analyses to compare the accurate and inaccurate word counts produced by students in pre-test and post-test assessments administered to both the control and experimental groups. The study was considered significant for $p<0.05$ at the 95% confidence level. SPSS 25.0 (Statistical Package for the Social Sciences) package program was used in the analysis of the collected data. In addition, the Excel program was used to draw the graphs of the tests and quizzes.

A focus group was formed from the experimental group for the analysis of qualitative data. Nine students were chosen from the experimental group and semi-structured interview questions were asked. 3 students were chosen the students who got the lowest grades in the pre-test and gets higher on the post-test. 3 students were chosen the students who got the middle grades in the pre-test and gets higher on the post-test. 3 students were chosen from the students who got the highest grades in the pre-test and gets higher on the post-test. Students' answers were analyzed by discourse analysis.

The focus group asked semi-structured interview questions. The answers given reported by discourse analysis. According to E Shaw & Bailey (2009), discourse analysis, which gives methods for examining meaning in speech or culture, is the study of social existence as understood via the examination of language in its broadest sense. The semi-structured interviews data analyzed by reviewing, coding and categorizing students' reflections focusing on the frequent answers and comments. Hastings, (2000) explained that the goal of an analysis may be to pinpoint the precise language usage in the conversation, possibly to investigate the motivations behind its particular use, and to take into account the results that are obtained. Participants were asked direct questions. Thus, participants clearly expressed their views on VR goggles integrated vocabulary teaching activities. Then, the patterns were analyzed to understand the possible reasons behind them and understand students' views about VR integrated activities.

To analyze the discourse, first it was interpreted. In this context, the word meanings in the discourse and the relations between the sentences were examined and interpreted. In the second stage, the configuration was done. In this context, the suggestions that emerged as a result of interpretation in a message were associated with a sentence or a word at the very beginning of the message, and the meaning in the discourse was reconstructed. Finally, macro-configuration was done. E Shaw & Bailey (2009) stated that in macro-level approaches, language in society is typically studied. In line with the research topic and purpose, macro-level inferences were made from the discourses. In the macro-configuration process, it was revealed how the words or sentences in the discourse contain propositions at the global level. During the implementation process, these data were examined and will be validated by the advisor. At the end of the process, all data analyzed. All data obtained was transcribed and presented to field experts to avoid uncertainty and bias.

CHAPTER 4. FINDINGS AND DISCUSSION

The subsequent section presents an examination of data, utilizing both quantitative and qualitative approaches. The first part begins with quantitative findings on students' pre-test, quizzes, revision tests, and post-test results. Following that, the findings of semi-structured interviews performed with the focus group were analyzed and qualitative data were shown. In this context, students' attitudes towards VR goggles integrated vocabulary teaching activities learned with three questions.

4.1 Students' tests results

There were 80 questions on 80 words that were covered in both the pre-test and post-test from the study. Each question held a value of one point. Ten questions covering ten words presented that week made up the quizzes. Each question was worth one point. There was a maximum score of 10. 30 questions on the revision test-I covered the vocabulary from the first, second, and third weeks. Each question held a value of one point. There were 30 questions on the revision test-II, which included the vocabulary from the fourth, fifth, and sixth weeks. Each question held a value of one point.

Considering post-test results, the experimental group got higher grades. Considering the difference of the pre and post test results it can be said that the experimental group was twice as successful. Since difference average of the control group is 22.10 percent, while the experimental group's is 53.56 percent. In the control group, the highest progress between pre-test and post-test was 30 percent. There is only one student who made 3 percent progress. However, the highest progress was 70 percent in the experimental group. There are two students with 70 percent progress in the experimental group. In the experimental group, 16 students made more than 50 percent progress in the post-test. These findings prove the success of using VR in English vocabulary teaching. According to the findings in the table 4 and 5, pre-test results of both groups are similar. This implies that both groups exhibited equivalent proficiency, and were unfamiliar with the majority of the target vocabulary.

Table 4. Test Results of The Control Group

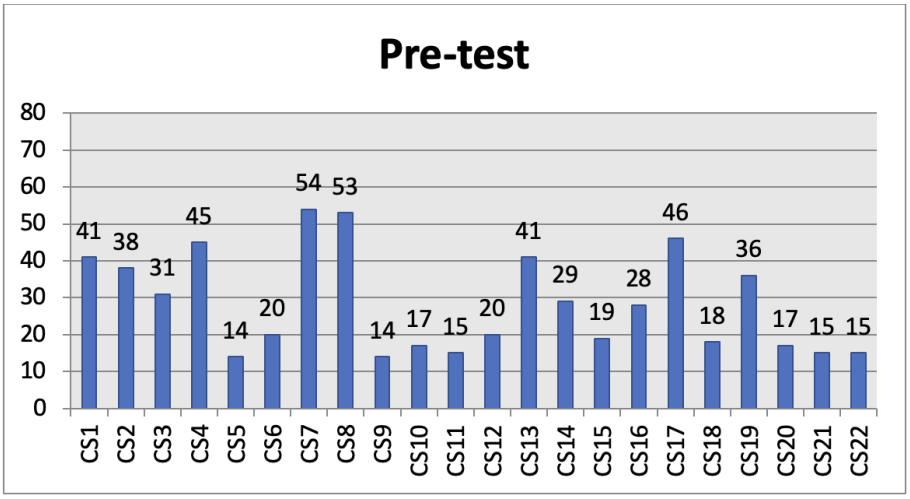
	Week 1	Week 1	Week 2	Week 3	Week 4	Week 5	Week 5	Week 6	Week 7	Week 8	Week 9	Hafta 15	Pre-Post Test	Pre-Post Test	POST-Test
	PRE-TEST-80	Q1-10	Q2-10	Q3-10	Q4-10	Q5-10	Revision-test I - 30	Q6-10	Q7-10	Q8-10	Revision Test II - 30	POST-TEST- 80	Difference	Difference Percentage	Unlearned Vocabulary
CS9	14	6	6	7	6	6	20	6	6	7	15	38	24	30%	42
CS5	14	6	8	5	7	7	18	7	7	7	19	37	23	28.75%	43
CS11	15	4	3	6	5	5	18	4	5	6	15	37	22	27.5%	43
CS21	15	5	3	3	6	6	22	7	6	7	23	37	22	27.5%	43
CS13	41	9	10	6	6	8	24	8	9	8	23	62	21	26.25%	18
CS12	20	6	6	6	7	6	15	7	4	6	20	41	21	26.25%	39
CS15	19	8	6	5	6	4	11	6	7	5	14	40	21	26.25%	40
CS10	17	5	6	7	5	4	16	7	6	7	20	38	21	26.25%	42
CS17	46	8	10	5	8	6	21	9	7	8	23	64	18	22.5%	16
CS3	31	10	7	8	7	7	22	8	8	6	19	49	18	22.5%	31
CS20	17	9	8	7	7	6	21	8	6	7	22	35	18	22.5%	45
CS22	15	7	7	8	6	7	16	7	7	8	17	33	18	22.5%	47
CS19	36	9	7	5	6	7	17	5	7	7	21	53	17	21.25%	27
CS18	18	8	7	6	6	7	14	4	4	6	16	34	16	20%	46
CS14	29	7	6	7	7	6	20	7	7	8	18	44	15	18.75%	36
CS16	28	6	5	7	5	4	17	6	6	6	13	43	15	18.75%	37
CS7	54	10	9	7	8	8	27	9	8	9	26	68	14	17.5%	12
CS1	41	9	8	7	8	6	18	6	8	8	22	55	14	17.5%	25
CS2	38	7	6	4	6	5	12	5	6	5	16	52	14	17.5%	28
CS8	53	10	10	6	7	9	24	9	8	9	23	66	13	16.25%	14
CS6	20	5	5	4	4	6	15	7	5	8	16	33	13	16.25%	47
CS4	45	10	7	9	7	8	23	8	8	7	23	56	11	13.75%	24
														22.10%	

Table 5. Test Results of The Experimental Group

	Week 1	Week 1	Week 2	Week 3	Week 4	Week 5	Week 5	Week 6	Week 7	Week 8	Week 9	Hafta 15	Pre-Post Test	Pre-Post Test	Post-Test
	PRE-TEST-80	Q1-10	Q2-10	Q3-10	Q4-10	Revision Test I- 30	Q5-10	Q6-10	Q7-10	Q8-10	Revision Test II - 30	POST-TEST-80	Difference	Difference Percentage	Unlearned Vocabulary
ES17	15	10	9	10	10	30	10	10	10	10	28	71	56	70%	9
ES1	14	8	10	9	10	28	9	9	9	8	25	70	56	70%	10
ES6	16	9	9	10	9	28	10	9	10	10	27	70	54	67.5%	10
ES21	17	9	9	10	9	26	10	9	8	9	26	68	51	63.75%	12
ES10	14	9	9	10	8	24	9	9	9	8	21	65	51	63.75%	5
ES11	20	9	10	10	9	24	10	10	8	8	26	69	49	61.25%	11
ES18	19	9	7	6	8	26	9	10	10	8	27	68	49	61.25%	12
ES16	22	7	9	9	9	25	9	10	10	9	25	69	47	58.75%	11
ES14	17	9	8	9	9	26	8	10	9	8	23	63	46	57.5%	17
ES7	33	9	10	10	9	28	10	10	10	9	29	76	43	53.75%	4
ES8	31	9	9	10	10	30	10	10	10	10	28	74	43	53.75%	6
ES22	32	9	9	8	10	27	9	10	10	8	28	74	42	52.5%	9
ES3	29	7	9	10	9	28	10	10	9	9	28	71	42	52.5%	9
ES20	24	9	10	10	10	28	9	10	10	8	27	66	42	52.5%	14
ES9	32	10	10	10	10	30	10	10	10	10	28	73	41	51.25%	7
ES25	32	9	9	9	10	25	9	10	9	9	27	73	41	51.25%	7
ES4	34	9	10	10	10	30	10	10	10	10	29	73	39	48.75%	7
ES19	34	9	10	8	10	26	9	10	9	9	27	73	39	48.75%	7
ES23	33	8	10	8	10	26	10	9	9	8	28	72	39	48.75%	8
ES5	38	9	9	10	10	27	9	10	10	10	30	76	38	47.5%	4
ES24	31	9	10	10	10	27	9	9	7	9	25	69	38	47.5%	11
ES12	38	9	9	10	9	30	10	10	10	9	28	74	36	45%	6
ES2	40	9	10	10	10	28	10	10	10	9	27	72	32	40%	8
ES13	47	10	10	10	10	30	10	10	10	10	30	76	29	36.25%	4
ES15	43	9	10	10	10	30	10	10	10	9	29	71	28	35%	9
														53.56%	

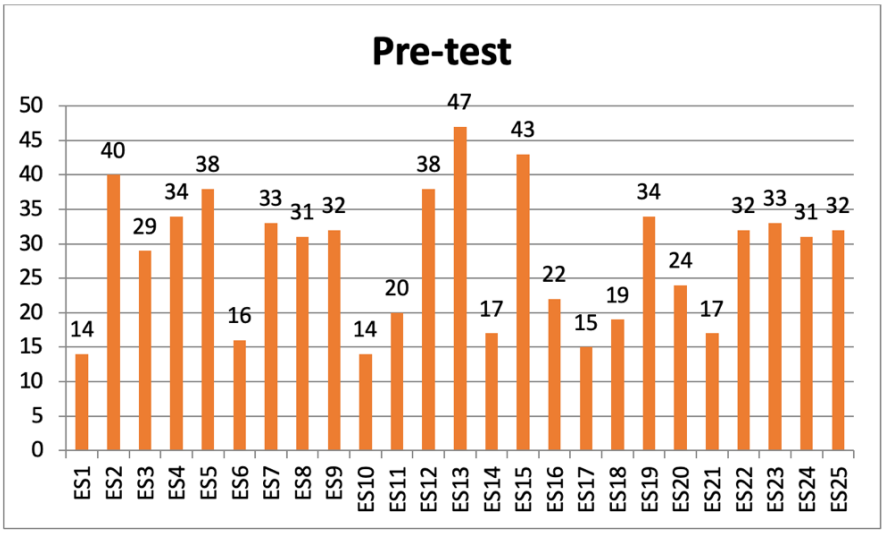
As per the findings of pre-test, the control group's pre-test scores ranged from 14 as the minimum to 54 as the maximum. Table 6 illustrates the pre-test outcomes of the students belonging to the control group.

Table 6. Pre-Test Results of The Control Group



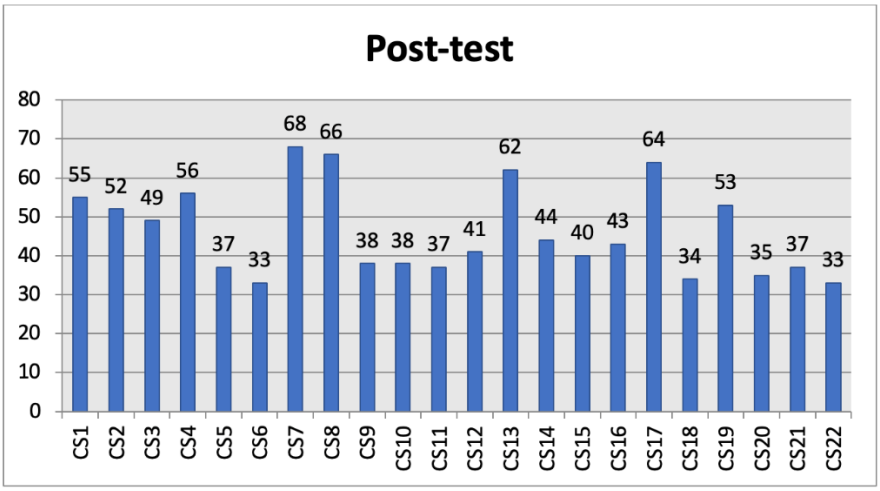
In accordance with the findings, the experimental group's pre-test results ranged from a minimum of 14 to a maximum of 47. Table 7 displays the pre-test scores of students who comprised the experimental group.

Table 7. Pre-Test Results of The Experimental Group



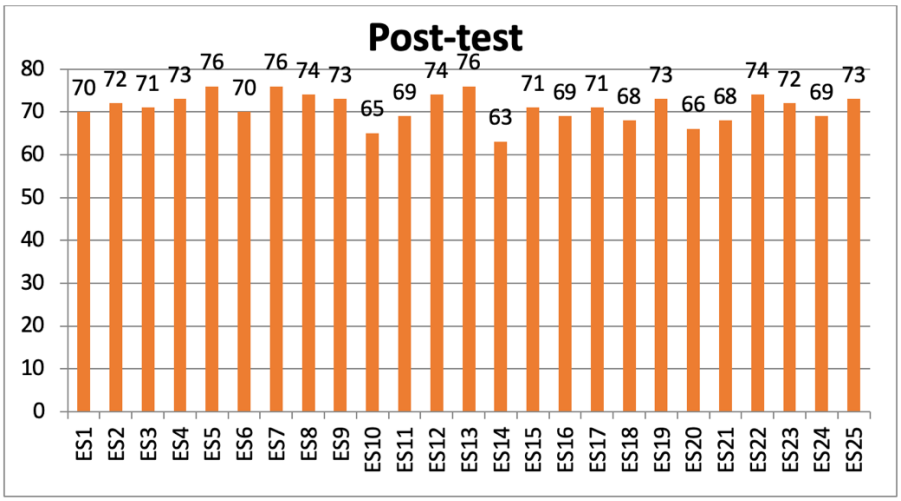
It is noted that the control group exhibited a range of post-test scores, with the lowest score 33 and the highest 68. Table 8 presents the post-test findings pertaining to the participants belonging to the control group.

Table 8. Post-Test Results of The Control Group



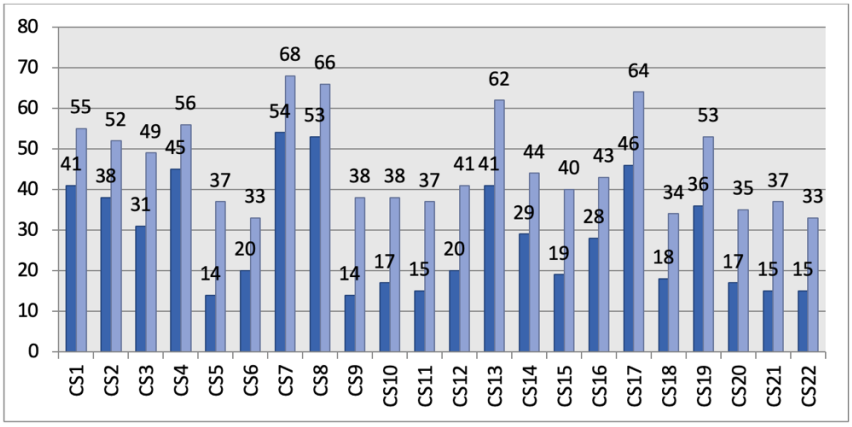
The post-test results of the experimental group indicate a range of scores from 63 to 76. Based on the findings, it can be deduced that the experimental group exhibited significantly greater achievement in the post-test compared to the control group. Table 9 displays the post-test outcomes of the experimental group's students.

Table 9. Post-Test Results of The Experimental Group



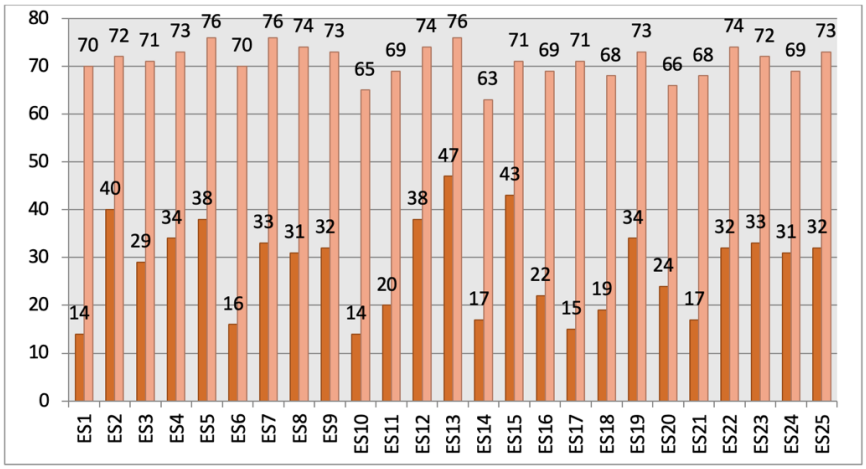
Upon examination of the advancement of the control group students from pre-test to post-test, it was observed that the disparity between the two assessments presented statistical significance ($p<0.05$). The results indicated a significant increase in the scores of the students in the post-test. Table 10 presents the progress observed among students in the control group as measured by their pre-test and post-test results.

Table 10. Progress of Control Group Students from Pre-Test to Post-Test



Upon evaluation of the progress exhibited by the members of the experimental group, it was ascertained that the disparity between their pre-test and post-test results held statistical significance ($p<0.05$). An appreciable increase in the students' test scores was witnessed in the post-test. Table 11 demonstrates the advancement of students belonging to the experimental group from the pre-test to the post-test.

Table 11. Progress of Experimental Group Students from Pre-Test to Post-Test



Based on the results given in the tables 12 and 13 the mean of the pre-test scores for the control group was determined to be 28.45±13.578 while the mean pre-test score for the experimental group was calculated as 28.20±9.708. independent sample t-test between the pre-tests, there was no discernible statistical discrepancy between groups (t: 0.073; p=0.942>0.05). This situation supports that the pre-test scores were not different from each other and both started the study under equal conditions.

Table 12. Dependent Sample T-Test Results of The Control Group

Control group	$\bar{x}$±S.D.	t	p
Pre-test	28,45±13,578	22,062	**<0,001***
Post-test	46,14±11,519		

Table 13. Dependent Sample T-Test Results of The Experimental Group

Experimental group	$\bar{x}$±S.D.	t	p
Pre-test	28,20±9,708	28,214	**<0,001***
Post-test	71,04±3,397		

The mean difference in pre-test-post-test scores for the control group was determined to be 17.68±3.759 whereas for the experimental group it was found to be 42.80±7.592. The findings of an independent sample t-test indicate a statistically significant variation that appears to exist between the pre-test and post-test scores of both groups (t: -14,653; p<0.001). Mean difference between pre-test and post-test scores in both groups exhibited significant statistical disparity. Notably, the observed discrepancy in means favored the experimental group. The significant disparity between the pre-test and post-test scores of the experimental group can be attributed to a unique intervention which took place in addition to the control group's activities. Specifically, vocabulary teaching was done using VR with the experimental group. Table 14 presents the results of an independent sample t-test, which examines the difference between pre- and post-tests.

Table 14. Independent Sample T-Test Results of The Difference Between Pre-Post Tests

Pre-test & Post-test (difference)	$\bar{x}$±S.D.	t	p
Control group	17,68±3,759	-14,653	**<0,001***
Experimental group	42,80±7,592		

Based on the findings, it was observed that a greater proportion of students provided incorrect responses to the pre-test questions in both groups. This indicates that the study was started under equal conditions. According to the findings, it can be concluded that the experimental group exhibited a greater number of students who accurately responded to the post-test questions. This indicates that VR integrated vocabulary teaching had positive effects on long-term vocabulary retention. Table 15 presents data pertaining to the research undertaken, specifically the 80 vocabulary terms that were taught and subsequently administered in a pre-test and table 16 presents the results of a study that involved the teaching of 80 words which were subsequently tested in a post-test. In addition to providing a summary of the parts of speech of these terms, the table presents the frequencies and percentages of correct and incorrect responses done by students in both the control and experimental groups.

Table 15. Vocabulary's Results of The Pre-Test

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
grocer (usage)	Incorrect	12	54,5	11	44,0
	Correct	10	45,5	14	56,0
green grocer (meaning)	Incorrect	6	27,3	6	24,0
	Correct	16	72,3	19	76,0
cherry (pronciation)	Incorrect	8	36,4	18	72,0
	Correct	14	63,6	7	28,0
punnet (usage)	Incorrect	14	63,6	18	72,0
	Correct	8	36,4	7	28,0
asparagus (meaning)	Incorrect	18	63,6	15	60,0
	Correct	4	36,4	10	40,0
scale (meaning)	Incorrect	13	59,1	14	56,0
	Correct	9	40,9	11	44,0
close (meaning)	Incorrect	15	68,2	16	64,0
	Correct	7	31,8	9	36,0
profession (pronunciation)	Incorrect	19	86,4	21	84,0
	Correct	3	13,6	4	16,0
vegs (usage)	Incorrect	6	27,3	7	28,0
	Correct	16	72,7	18	72,0
next to (meaning)	Incorrect	19	86,4	18	72,0
	Correct	3	13,6	7	28,0
homeopathy (pronunciation)	Incorrect	20	90,9	25	100,0
	Correct	2	9,1	0	0,0
moisturizer (pronunciation)	Incorrect	12	54,5	17	68,0
	Correct	10	45,5	8	32,0
body scrub (usage)	Incorrect	20	90,9	22	88,0
	Correct	2	9,1	3	12,0
makeup counter (meaning)	Incorrect	10	45,5	13	52,0
	Correct	12	54,5	12	48,0
supplement (meaning)	Incorrect	9	40,9	10	40,0
	Correct	13	59,1	15	60,0
hair treatment products (meaning)	Incorrect	12	54,5	15	60,0
	Correct	10	45,5	10	40,0
shop (usage)	Incorrect	12	54,5	17	68,0
	Correct	10	45,5	8	32,0

Table 15. Vocabulary's Results of The Pre-Test (Continued)

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
entrance (meaning)	Incorrect	22	100,0	22	88,0
	Correct	0	0,0	3	12,0
skin (meaning)	Incorrect	11	50,0	13	52,0
	Correct	11	50,0	12	48,0
shelf (usage)	Incorrect	15	68,2	19	76,0
	Correct	7	31,8	6	24,0
farm (pronunciation)	Incorrect	6	27,3	8	32,0
	Correct	16	72,7	17	68,0
tractor (meaning)	Incorrect	5	22,7	3	12,0
	Correct	17	77,3	22	88,0
chicken coop (meaning)	Incorrect	19	86,4	22	88,0
	Correct	3	13,6	3	12,0
barn (usage)	Incorrect	14	63,4	17	68,0
	Correct	8	36,4	8	32,0
herb garden (meaning)	Incorrect	14	63,6	20	80,0
	Correct	8	36,4	5	20,0
watering can (meaning)	Incorrect	17	77,3	21	84,0
	Correct	5	22,7	4	16,0
building (meaning)	Incorrect	8	36,4	10	40,0
	Correct	14	63,6	15	60,0
dry (pronunciation)	Incorrect	5	22,7	0	0,0
thyme (pronunciation)	Incorrect	17	22,7	16	64,0
	Correct	5	77,3	9	36,0
safe (usage)	Incorrect	9	40,9	10	40,0
	Correct	13	59,1	15	60,0
plumbing shop (meaning)	Incorrect	22	100,0	25	100,0
	Correct	0	0,0	0	0,0
showerhead (usage)	Incorrect	10	45,5	17	68,0
	Correct	12	54,5	8	32,0
boiler (form)	Incorrect	17	77,3	22	88,0
	Correct	5	22,7	3	12,0
duct tape (meaning)	Incorrect	19	86,4	23	92,0
	Correct	3	13,6	2	8,0

Table 15. Vocabulary's Results of The Pre-Test (Continued)

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
flexible hose (meaning)	Incorrect	22	100,0	25	100,0
	Correct	0	0,0	0	0,0
equipment (pronunciation)	Incorrect	19	86,4	24	96,0
	Correct	3	13,6	1	4,0
temperature (pronunciation)	Incorrect	16	72,7	15	60,0
	Correct	6	27,3	10	40,0
water resistant (meaning)	Incorrect	12	54,5	8	32,0
	Correct	10	45,5	17	68,0
tap (form)	Incorrect	18	81,8	12	48,0
	Correct	4	18,2	13	52,0
plumber (usage)	Incorrect	17	77,3	23	92,0
	Correct	5	22,7	2	8,0
art (usage)	Incorrect	8	36,4	10	40,0
	Correct	14	63,6	15	60,0
easel (usage)	Incorrect	20	90,9	25	100,0
	Correct	2	9,1	0	0,0
picture frame (form)	Incorrect	20	90,9	23	92,0
	Correct	2	9,1	2	8,0
art print (usage)	Incorrect	13	59,1	19	76,0
	Correct	9	40,9	6	24,0
oil painting (usage)	Incorrect	13	59,1	14	56,0
	Correct	9	40,9	11	44,0
canvas print (meaning)	Incorrect	16	72,7	19	76,0
	Correct	6	27,3	6	24,0
gallery (form)	Incorrect	5	22,7	4	16,0
	Correct	17	77,3	21	84,0
window (meaning)	Incorrect	7	31,8	4	16,0
	Correct	15	68,2	21	84,0
beautiful (pronunciation)	Incorrect	17	77,3	17	68,0
	Correct	5	22,7	8	32,0
colour (meaning)	Incorrect	11	50,0	7	28,0
	Correct	11	50,0	18	72,0
library (pronunciation)	Incorrect	16	72,7	17	68,0
	Correct	6	27,3	8	32,0

Table 15. Vocabulary's Results of The Pre-Test (Continued)

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
bookshelf (meaning)	Incorrect	19	86,4	19	76,0
	Correct	3	13,6	6	24,0
fantasy books (usage)	Incorrect	15	68,2	17	68,0
	Correct	7	31,8	8	32,0
historical books (form)	Incorrect	11	50,0	12	48,0
	Correct	11	50,0	13	52,0
large print books (meaning)	Incorrect	19	86,4	21	84,0
	Correct	3	13,6	4	16,0
fiction books (form)	Incorrect	13	59,1	18	72,0
	Correct	9	40,9	7	28,0
computer (meaning)	Incorrect	7	31,8	10	40,0
	Correct	15	68,2	15	60,0
war (usage)	Incorrect	8	36,4	9	36,0
	Correct	14	63,6	16	64,0
vision (usage)	Incorrect	21	95,5	22	88,0
	Correct	1	4,5	3	12,0
politics (usage)	Incorrect	9	40,9	15	60,0
	Correct	13	59,1	10	40,0
gym (pronunciation)	Incorrect	10	45,5	13	52,0
	Correct	12	54,5	12	48,0
stability ball (form)	Incorrect	22	100,0	25	100,0
	Correct	0	0,0	0	0,0
dumbbell (form)	Incorrect	16	72,7	21	84,0
	Correct	6	27,3	4	16,0
bench (usage)	Incorrect	16	72,7	21	84,0
	Correct	6	27,3	4	16,0
exercise mat (meaning)	Incorrect	7	31,8	4	16,0
	Correct	15	68,2	21	84,0
treadmill (meaning)	Incorrect	21	95,5	24	96,0
	Correct	1	4,5	1	4,0
stomach (pronunciation)	Incorrect	21	95,5	24	96,0
	Correct	1	4,5	1	4,0
muscles (usage)	Incorrect	14	63,6	14	56,0
	Correct	8	36,4	11	44,0

Table 15. Vocabulary's Results of The Pre-Test (Continued**)**

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
wall (meaning)	Incorrect	17	77,3	21	84,0
	Correct	5	22,7	4	16,0
weight	Incorrect	22	100,0	23	92,0
	Correct	0	0,0	2	8,0
window seats (form)	Incorrect	17	77,3	23	92,0
	Correct	5	22,7	2	8,0
cutlery (usage)	Incorrect	21	95,5	23	92,0
	Correct	1	4,5	2	8,0
napkin (usage)	Incorrect	17	77,3	23	92,0
	Correct	5	22,7	2	8,0
condiments (usage)	Incorrect	22	100,0	21	84,0
	Correct	0	0,0	4	16,0
kitchen (meaning)	Incorrect	2	9,1	3	12,0
	Correct	20	90,9	22	88,0
serve (pronunciation)	Incorrect	22	100,0	25	100,0
	Correct	0	0,0	0	0,0
to wipe (meaning)	Incorrect	18	81,8	25	100,0
	Correct	4	18,2	0	0,0
salt (pronunciation)	Incorrect	18	81,8	21	84,0
	Correct	4	18,2	4	16,0
flavour (usage)	Incorrect	18	81,8	18	72,0
	Correct	4	18,2	7	28,0
table (form)	Incorrect	22	100,0	25	100,0
	Correct	0	0,0	0	0,0

Table 16. Vocabulary Results of The Post-Test

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
grocer (usage)	Incorrect	1	4,5	0	0,0
	Correct	21	95,5	25	100,0
green grocer (meaning)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
cherry (pronunciation)	Incorrect	7	31,8	10	40,0
	Correct	15	68,2	15	60,0
punnet (usage)	Incorrect	12	54,5	2	8,0
	Correct	10	45,5	23	92,0
asparagus (meaning)	Incorrect	12	54,5	2	8,0
	Correct	10	45,5	23	92,0
scale (meaning)	Incorrect	8	36,4	0	0,0
	Correct	14	63,6	25	100,0
close (meaning)	Incorrect	9	40,9	0	0,0
	Correct	13	59,1	25	100,0
profession (pronunciation)	Incorrect	18	81,8	15	60,0
	Correct	4	18,2	10	40,0
vegs (usage)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
next to (meaning)	Incorrect	15	68,2	4	16,0
	Correct	7	31,8	21	84,0
homeopathy (pronunciation)	Incorrect	19	86,4	22	88,0
	Correct	3	13,6	3	12,0
moisturizer (pronunciation)	Incorrect	12	54,5	12	48,0
	Correct	10	45,5	13	52,0
body scrub (usage)	Incorrect	4	18,2	0	0,0
	Correct	18	81,8	25	100,0
makeup counter (meaning)	Incorrect	3	13,6	0	0,0
	Correct	19	86,4	25	100,0
supplement (meaning)	Incorrect	8	36,4	0	0,0
	Correct	14	63,6	25	100,0
hair treatment products (meaning)	Incorrect	7	31,8	1	4,0
	Correct	15	68,2	24	96,0

Table 16. Vocabulary Results of The Post-Test (Continued**)**

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
shop (usage)	Incorrect	2	9,1	0	0,0
	Correct	20	90,9	25	25,0
entrance (meaning)	Incorrect	20	90,9	4	16,0
	Correct	2	9,1	21	84,0
skin (meaning)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
shelf (usage)	Incorrect	10	45,5	0	0,0
	Correct	12	54,5	25	100,0
farm (pronunciation)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
tractor (meaning)	Incorrect	1	4,5	0	0,0
	Correct	21	95,5	25	100,0
chicken coop (meaning)	Incorrect	18	81,8	4	16,0
	Correct	4	18,2	21	84,0
barn (usage)	Incorrect	2	9,1	1	4,0
	Correct	20	90,9	24	96,0
herb garden (meaning)	Incorrect	8	36,4	0	0,0
	Correct	14	63,6	25	100,0
watering can (meaning)	Incorrect	11	50,0	0	0,0
	Correct	11	50,0	25	100,0
building (meaning)	Incorrect	8	36,4	0	0,0
	Correct	14	63,6	25	100,0
dry (pronunciation)	Incorrect	1	4,5	0	0,0
	Correct	21	95,5	25	100,0
thyme (pronunciation)	Incorrect	11	50,0	6	24,0
	Correct	11	50,0	19	76,0
safe (usage)	Incorrect	1	4,5	0	0,0
	Correct	21	95,5	25	100,0
plumbing shop (meaning)	Incorrect	15	68,2	3	12,0
	Correct	7	31,8	22	88,0
showerhead (usage)	Incorrect	2	9,1	0	0,0
	Correct	20	90,9	25	100,0

Table 16. Vocabulary Results of The Post-Test (Continued)

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
boiler (form)	Incorrect	11	50,0	0	0,0
	Correct	11	50,0	25	100,0
duct tape (meaning)	Incorrect	17	77,3	2	8,0
	Correct	5	22,7	23	92,0
flexible hose	Incorrect	21	95,5	10	40,0
(meaning)	Correct	1	4,5	15	60,0
equipment	Incorrect	19	86,4	20	80,0
(pronunciation)	Correct	3	13,6	5	20,0
temperature	Incorrect	15	68,2	8	32,0
(pronunciation)	Correct	7	31,8	17	68,0
water resistant	Incorrect	4	18,2	0	0,0
(meaning)	Correct	18	81,8	25	100,0
tap (form)	Incorrect	7	31,8	0	0,0
	Correct	15	68,2	25	100,0
plumber (usage)	Incorrect	5	22,7	0	0,0
	Correct	17	77,3	25	100,0
art (usage)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
easel (usage)	Incorrect	18	81,8	4	16,0
	Correct	4	18,2	21	84,0
picture frame (form)	Incorrect	17	77,3	4	16,0
	Correct	5	22,7	21	84,0
art print (usage)	Incorrect	9	40,9	2	8,0
	Correct	13	59,1	23	92,0
oil painting (usage)	Incorrect	11	50,0	0	0,0
	Correct	11	50,0	25	100,0
canvas print (meaning)	Incorrect	12	54,5	1	4,0
	Correct	10	45,5	24	96,0
gallery (form)	Incorrect	3	13,6	0	0,0
	Correct	19	86,4	25	100,0
window (meaning)	Incorrect	3	13,6	2	8,0
	Correct	19	86,4	23	92,0

Table 16. Vocabulary Results of The Post-Test (Continued)

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
beautiful (pronunciation)	Incorrect	16	72,7	13	52,0
	Correct	6	27,3	12	48,0
colour (meaning)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
library (pronunciation)	Incorrect	5	22,7	1	4,0
	Correct	17	77,3	24	96,0
bookshelf (meaning)	Incorrect	17	77,3	4	16,0
	Correct	5	22,7	21	84,0
fantasy books (usage)	Incorrect	12	54,5	0	0,0
	Correct	10	45,5	25	100,0
historical books (form)	Incorrect	9	40,9	0	0,0
	Correct	13	59,1	25	100,0
large print books (meaning)	Incorrect	12	54,5	0	0,0
	Correct	10	45,5	25	100,0
fiction books (form)	Incorrect	12	54,5	3	12,0
	Correct	10	45,5	22	88,0
computer (meaning)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
war (usage)	Incorrect	5	22,7	0	0,0
	Correct	17	77,3	25	100,0
vision (usage)	Incorrect	19	86,4	9	36,0
	Correct	3	13,6	16	64,0
politics (usage)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
gym (pronunciation)	Incorrect	3	13,6	0	0,0
	Correct	19	86,4	25	100,0
stability ball (form)	Incorrect	22	100,0	7	28,0
	Correct	0	0,0	18	72,0
dumbbell (form)	Incorrect	14	63,6	5	20,0
	Correct	8	36,4	20	80,0
bench (usage)	Incorrect	11	50,0	0	0,0
	Correct	11	50,0	25	100,0

Table 16. Vocabulary Results of The Post-Test (Continued**)**

Vocabulary	Results	Control group		Experimental group	
		n	%	n	%
exercise mat (meaning)	Incorrect	2	9,1	0	0,0
	Correct	20	90,9	25	100,0
treadmill (meaning)	Incorrect	19	86,4	2	8,0
	Correct	3	13,6	23	92,0
stomach (pronunciation)	Incorrect	20	90,9	15	60,0
	Correct	2	9,1	10	40,0
muscles (usage)	Incorrect	10	45,5	1	4,0
	Correct	12	54,5	24	96,0
wall (meaning)	Incorrect	5	22,7	0	0,0
	Correct	17	77,3	25	100,0
weight	Incorrect	6	27,3	0	0,0
	Correct	16	72,7	25	100,0
window seats (form)	Incorrect	11	50,0	0	0,0
	Correct	11	50,0	25	100,0
cutlery (usage)	Incorrect	18	81,8	3	12,0
	Correct	4	18,2	22	88,0
napkin (usage)	Incorrect	13	59,1	2	8,0
	Correct	9	40,9	23	92,0
condiments (usage)	Incorrect	19	86,4	2	8,0
	Correct	3	13,6	23	92,0
kitchen (meaning)	Incorrect	0	0,0	0	0,0
	Correct	22	100,0	25	100,0
serve (pronunciation)	Incorrect	20	90,9	13	52,0
	Correct	2	9,1	12	48,0
to wipe (meaning)	Incorrect	10	45,5	1	4,0
	Correct	12	54,5	24	96,0
salt (pronunciation)	Incorrect	13	59,1	2	8,0
	Correct	9	40,9	23	92,0
flavour (usage)	Incorrect	15	68,2	8	32,0
	Correct	7	31,8	17	68,0
table (form)	Incorrect	0	0,0	0	0,0

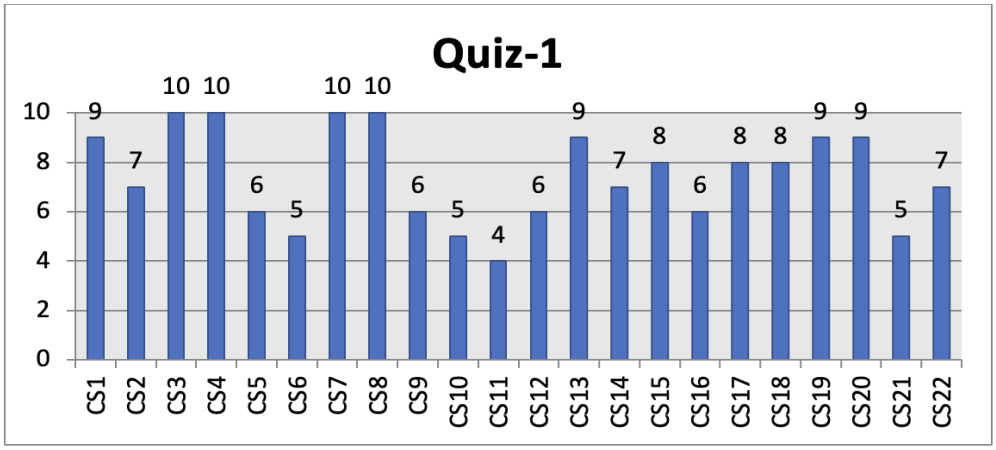
When aspects of vocabulary considered 8 students answered questions incorrect about pronunciation and 1 student answered the question incorrect about form. According to this, common vocabulary errors of students were in pronunciation. At the same time, incorrect answered words are generally words that have more than two syllables or phrases. Table 17 indicates nine most common vocabulary errors.

Table 17. Ten Most Common Errors of Vocabulary

Vocabulary	Aspect
cherry	**pronunciation**
profession	**pronunciation**
homeopathy	**pronunciation**
moisturizer	**pronunciation**
flexible hose	**form**
equipment	**pronunciation**
beautiful	**pronunciation**
stomach	**pronunciation**
serve	**pronunciation**

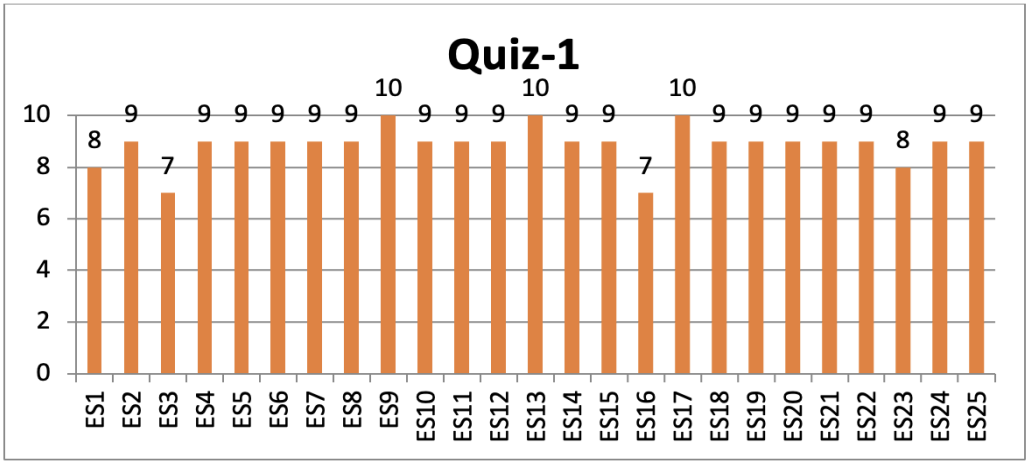
In the first quiz of the control group, a total of four students achieved a perfect score of ten. It is found that the minimum score attained in quiz-1 by the control group was 4. Table 18 displays the outcomes of quiz-1 conducted for the control group.

Table 18. Quiz-1 Results of The Control Group



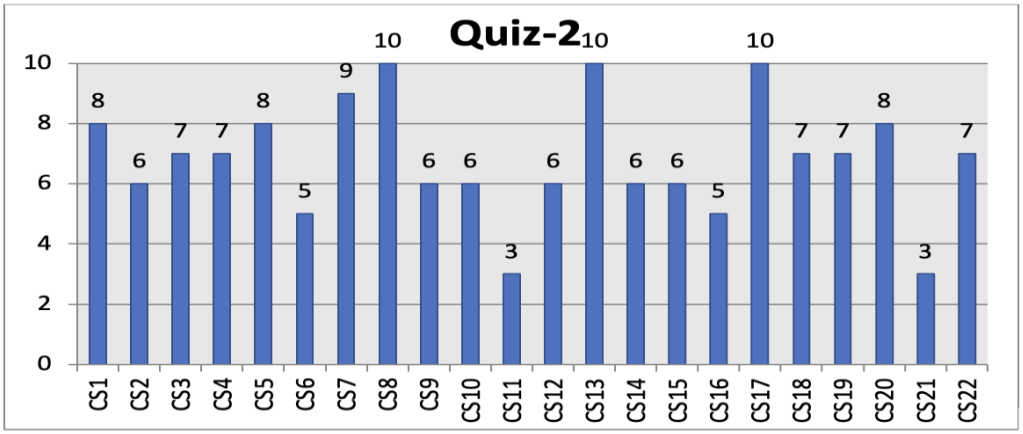
In the first quiz of the experimental group, a group of three students achieved perfect scores, while a total of eighteen students secured scores of nine. According to observation, the experimental group students attained a minimum score of seven in quiz-1. From a certain standpoint, it is evident that the students in the experimental group exhibited superior performance compared to those in the control group based on their quiz-1 scores. Table 19 presents the outcomes of the quiz-1 of the experimental group.

Table 19. Quiz-1 Results of The Experimental Group



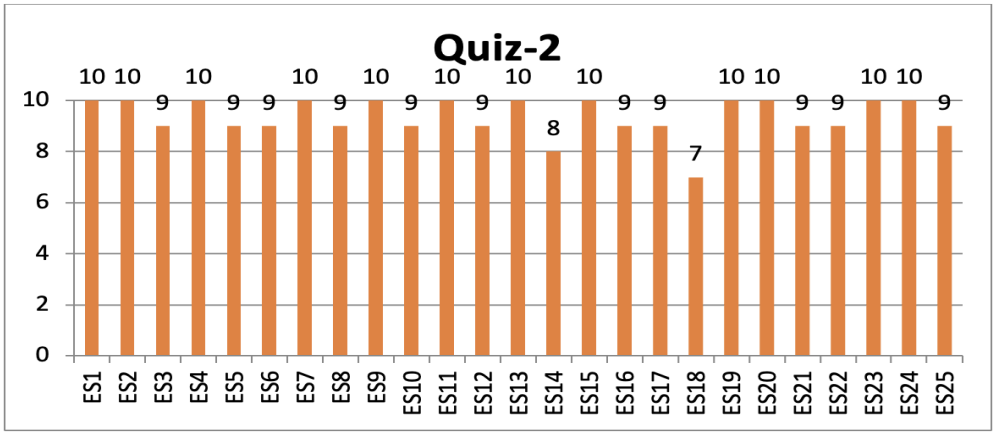
An observation was made indicating that the control group students achieved a minimum score of 3 on quiz-2. Two students got three. Three students attained a perfect score of 10 on quiz-2. Table 20 outlines the quiz-2 outcomes attained by students in the control group.

Table 20. Quiz-2 Results of The Experimental Group



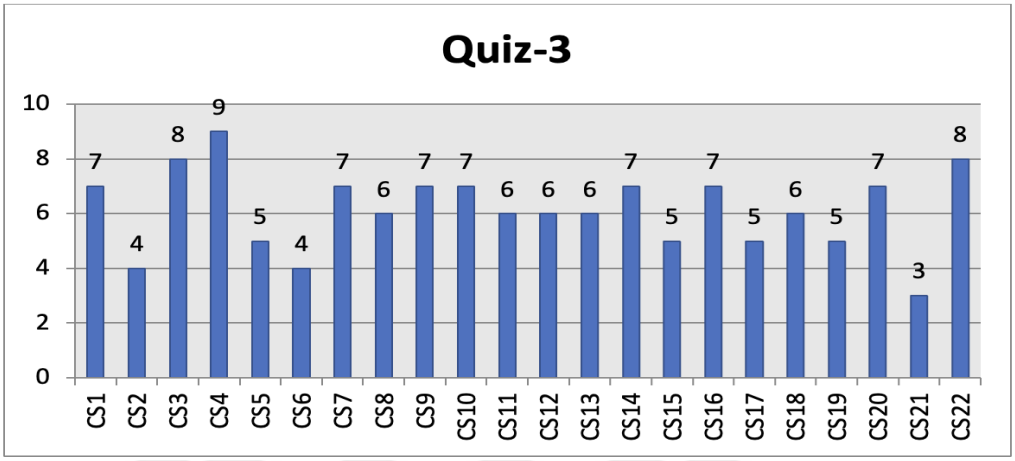
The results of quiz-2 indicate that 12 students achieved perfect scores, while 11 students got nine in the experimental group. The minimum score obtained from quiz-2 was 7. From this perspective, it was noticeable that the students belonging to the experimental group exhibited superior performance as compared to those belonging to the control group, as evidenced by their score on the quiz-2. Table 21 presents the test scores of students in the experimental group for quiz-2.

Table 21. Quiz-2 Results of The Experimental Group



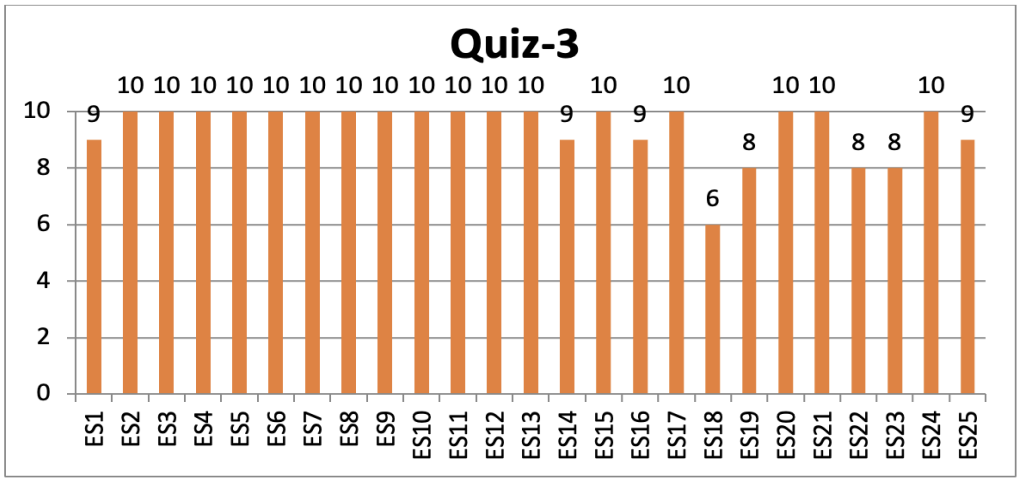
It was noted that the maximum score attained on quiz-3 was 9, while the minimum score stood at 3 in the control group. Table 22 presents the outcomes of quiz-3 for the participants belonging to the control group.

Table 22. Quiz-3 Results of The Control Group



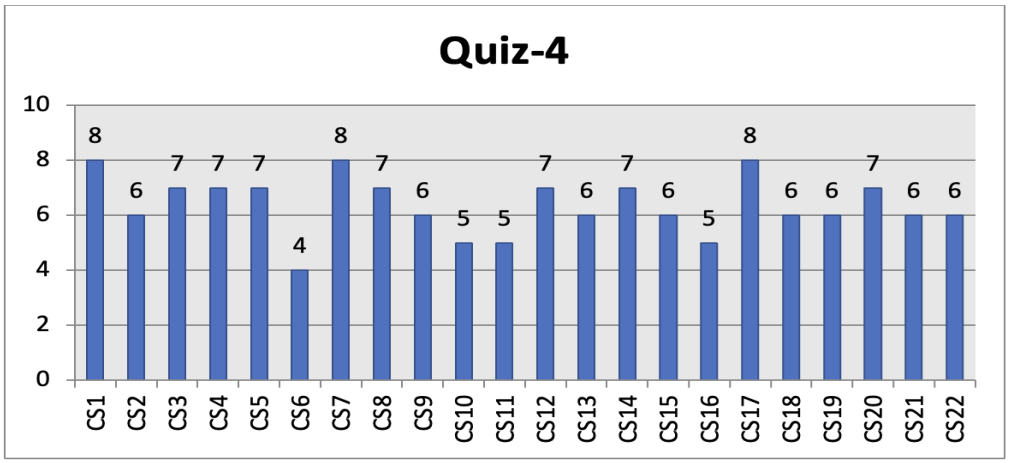
Seventeen students obtained full marks on quiz-3, while four students received a score of nine in the experimental group. The minimum score achieved in quiz-3 was 6. From this perspective, it is evident that the group exposed to the experimental conditions exhibited a higher level of achievement as compared to the control group, as reflected in their performance on quiz-3. Table 23 displays the results of quiz-3 for the experimental group students.

Table 23. Quiz-3 Results of The Experimental Group



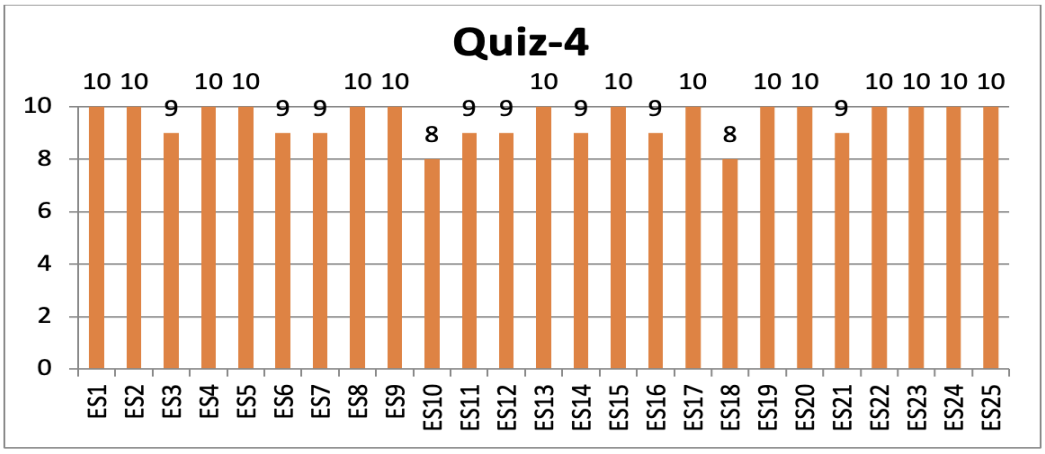
It was observed that the range of scores obtained in quiz-4 varied from a minimum of 4 to a maximum of 8 in the control group. Table 24 delineates the quiz-4 outcomes of the students in the control group.

Table 24. Quiz-4 Results of The Control Group



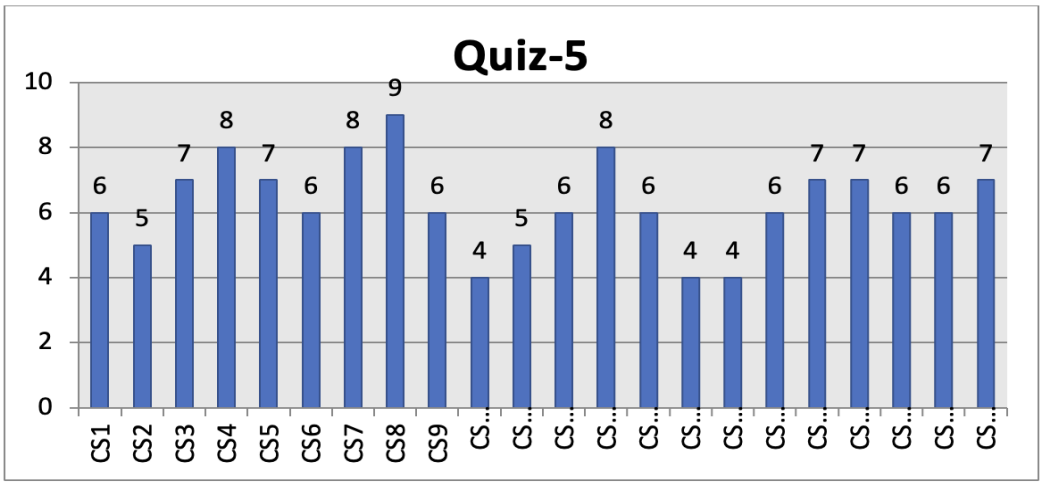
15 students attained a perfect score of 10 in quiz-4, while 8 other participants garnered a score of 9 in the experimental group. It was observed that the minimum score achieved in quiz-4 by the students was 8. From this perspective, a discernible pattern emerges indicating that the students belonging to the experimental group outperformed their counterparts in the control group, as evidenced by their superior performance in quiz-4. Table 25 presents the outcomes of quiz-4 for the student population comprising the experimental group.

Table 25. Quiz-4 Results of The Experimental Group



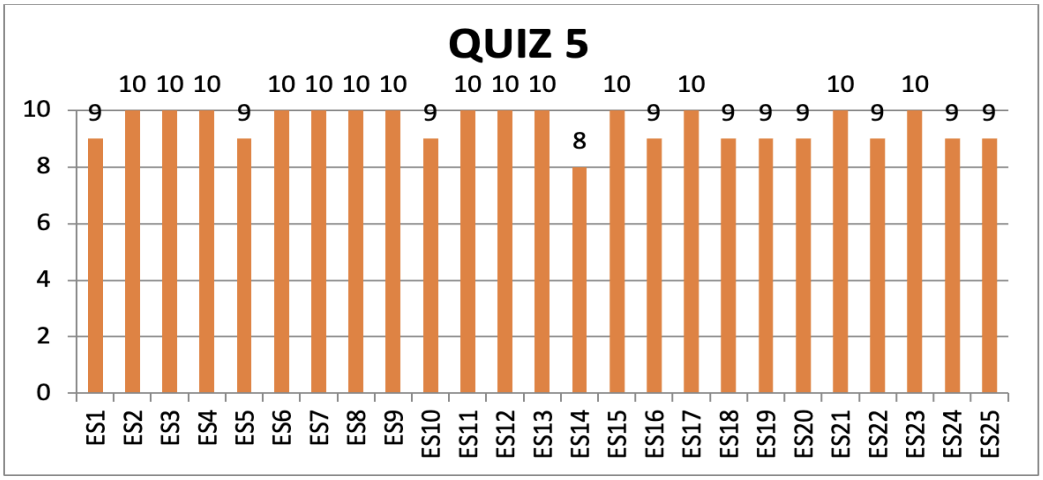
The results of the quiz-5 indicated that the maximum score achieved was 9, while the minimum score obtained was 4 in the control group. Table 26 presents the outcomes of quiz-5 for students in the control group.

Table 26. Quiz-5 Results of The Control Group



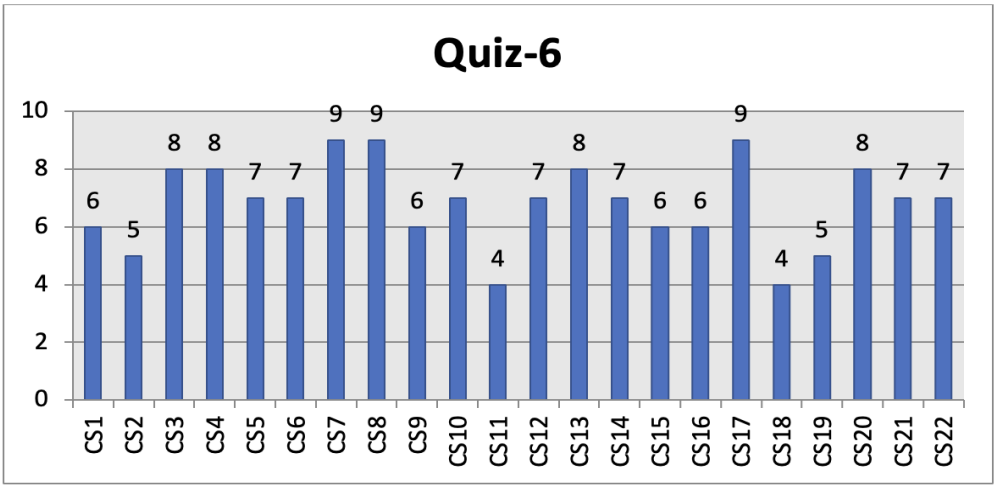
Fourteen students achieved a perfect score of 10 in the quiz-5, whereas ten students obtained a score of 9 in the experimental group. It was observed that the experimental group students achieved a minimum score of 8 on quiz-5. From a theoretical perspective, the scores obtained by the experimental group students on quiz-5 demonstrated a greater level of success in comparison to the control group students. Table 27 presents the quiz-5 outcomes of learners belonging to the experimental group.

Table 27. Quiz-5 Results of The Experimental Group



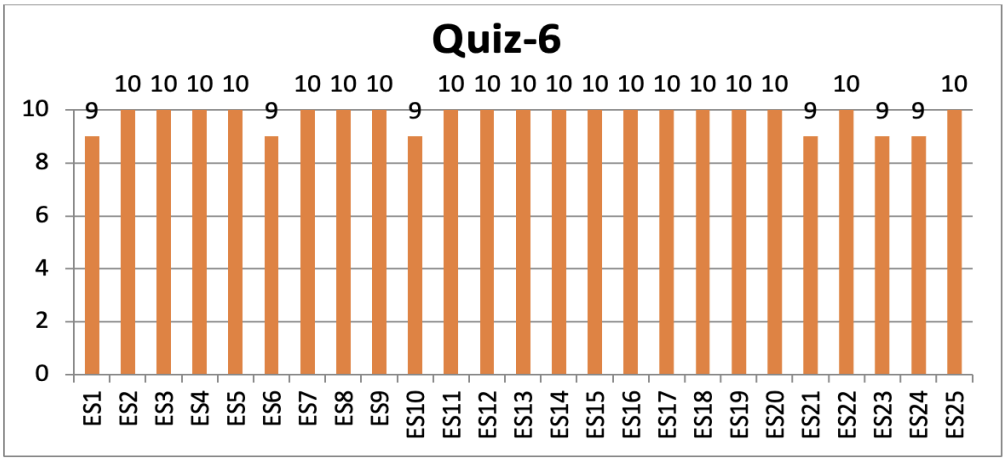
The examination of quiz-6 revealed that the maximum score acquired was 9, while the minimum score attained was 4 in the control group. Table 28 presents the quiz-6 outcomes of the students belonging to the control group.

Table 28. Quiz-6 Results of The Control Group



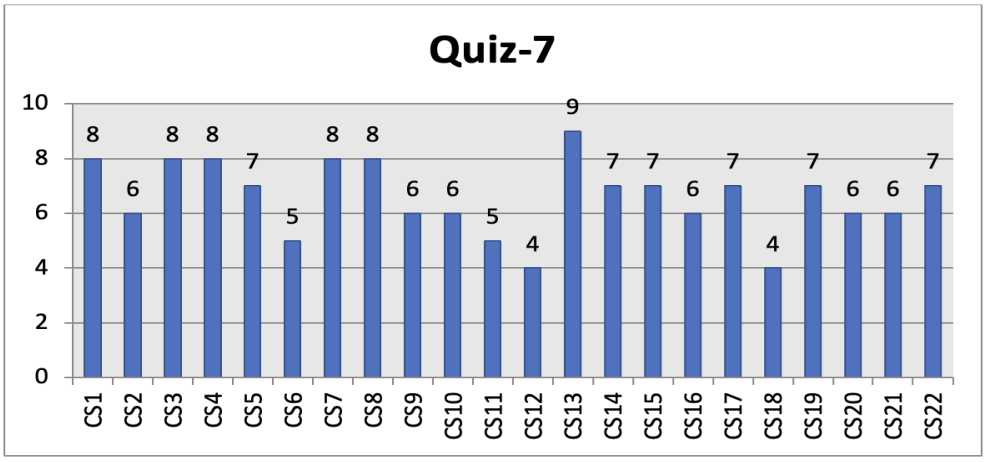
Nineteen students achieved perfect scores on quiz-6, while six other students received a score of nine in the experimental group. The lowest score achieved by students in the experimental group on quiz-6 was six. It is evident that the students from the experimental group exhibited superior performance in comparison to their peers from the control group, as evidenced by their scores on quiz-6. The outcomes of quiz-6 undertaken by the participants of the experimental group are presented in table 29.

Table 29. Quiz-6 Results of The Experimental Group



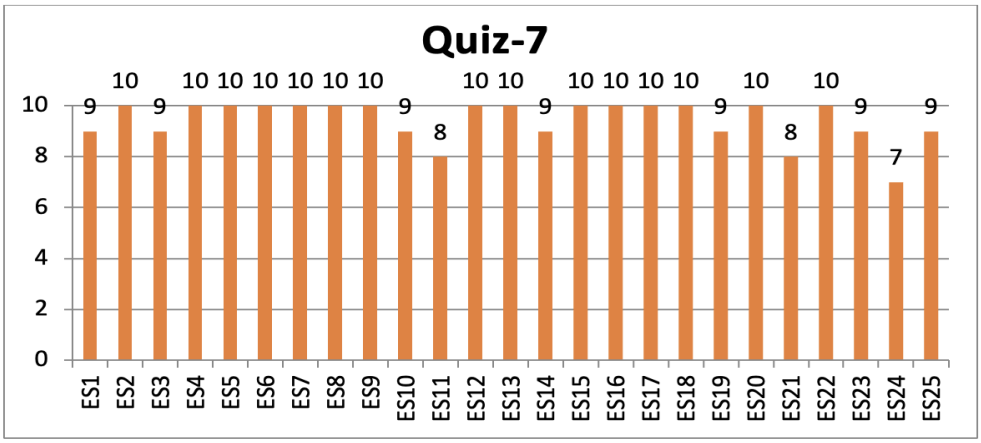
It was found that the quiz-7 exhibited a range of scores, ranging from a minimum score of 4 to a maximum score of 9 in the control group. The outcomes of quiz-7 of the control group are presented in table 30.

Table 30. Quiz-7 Results of The Control Group



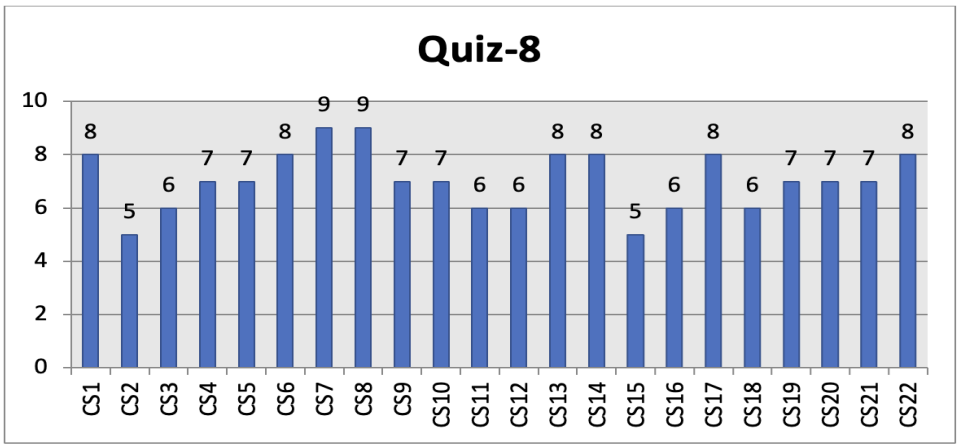
Fifteen students achieved perfect scores on the quiz-7 assessment, while seven students got scores just below this benchmark, garnering nine out of ten in the experimental group. It has been noted that the experimental group students achieved a minimum score of 7 on quiz-7. Therefore, it is evident that the academic performance of the students in the experimental group surpassed that of their counterparts in the control group, as evidenced by their superior performance on quiz-7 evaluations. Table 31 presents the results of quiz-7 belonging to the experimental group.

Table 31. Quiz-7 Results of The Experimental Group



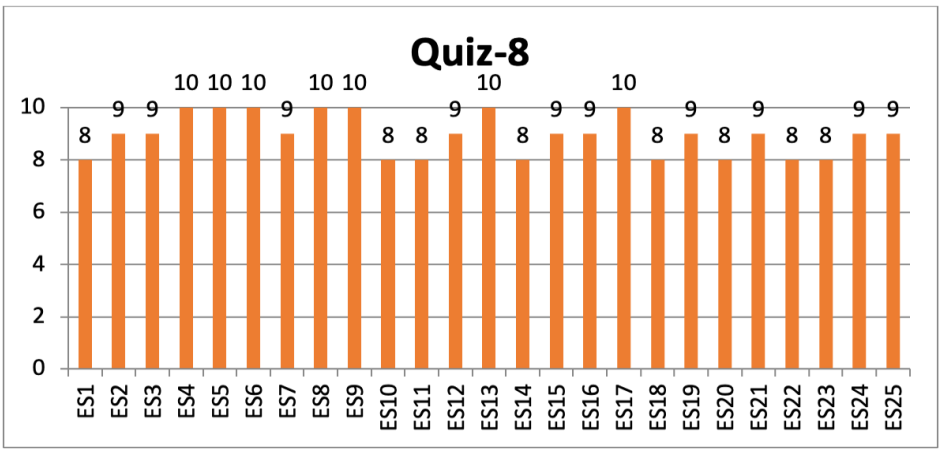
According to the results of the quiz-8, the maximum achievement was 9, while the minimum score was 5 in the control group. Table 32 illustrates the outcomes of the quiz-8 assessment for students belonging to the control group.

Table 32. Quiz-8 Results of The Control Group



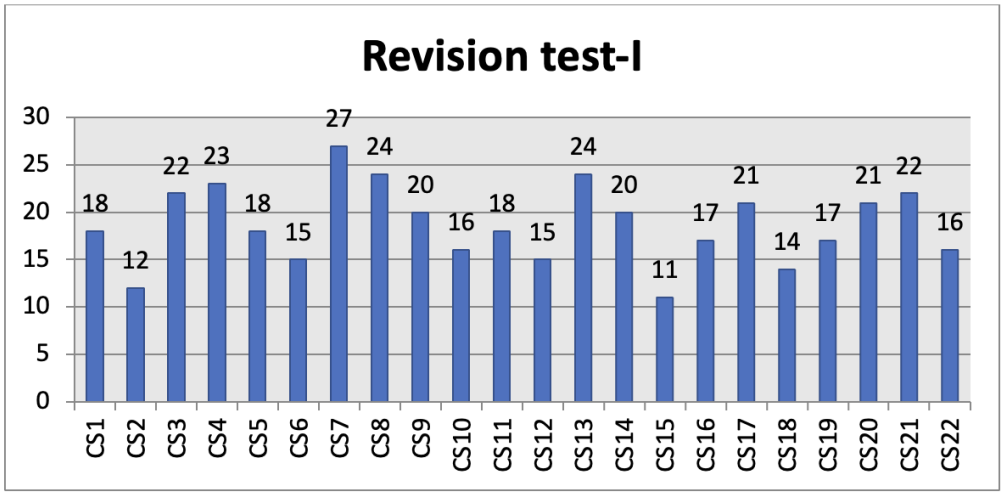
A total of seven students achieved full marks on the quiz-8, while ten students secured a score of nine in the experimental group. The minimum score obtained in quiz-8 was 8. The results indicate that the students in the experimental group exhibited superior performance compared to their peers in the control group as evidenced by their quiz-8 scores. Thereby, it is seen that the experimental group students performed better than the control group students based on their quiz-8 score. Table 33 illustrates the outcomes of quiz-8 for the experimental group.

Table 33. Quiz-8 Results of The Experimental Group



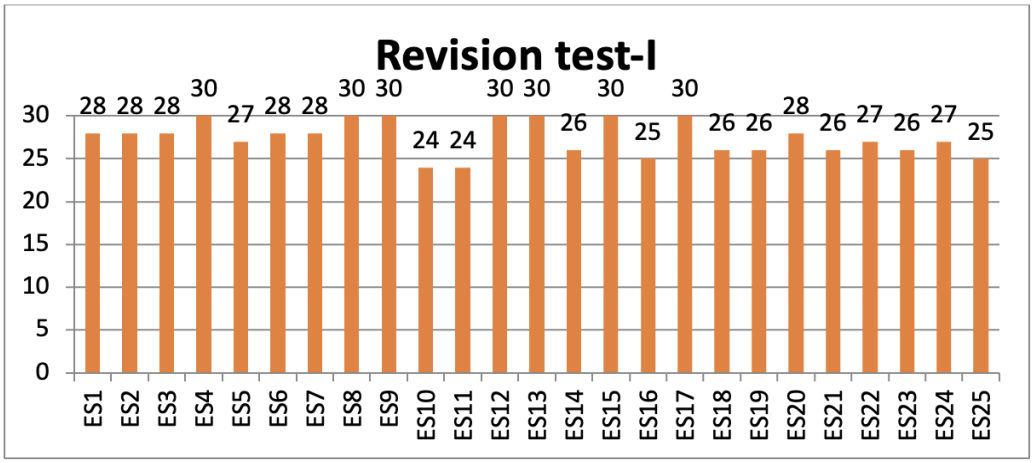
The control group students exhibited a range of scores, with the maximum obtained being 27 and the minimum obtained being 11 in revision test-I. Table 34 portrays the outcomes of revision test-I of the control group.

Table 34. Revision Test-I Results of The Control Group



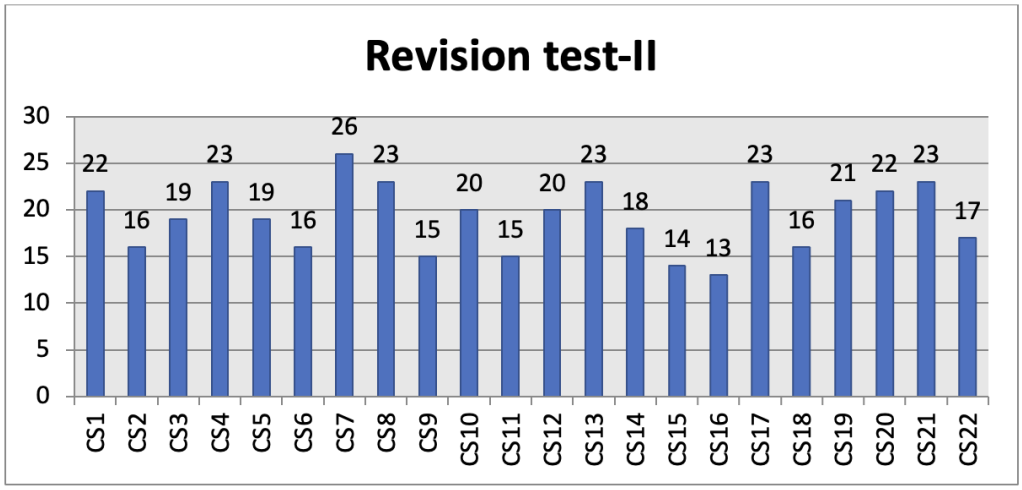
Seven experimental group students got full scores of 30 in revision test-I. The minimum score was 24. Based on the findings, it was observed that the experimental group exhibited significantly elevated scores in revision test-I as compared to the scores achieved by the control group students. The outcome demonstrates the efficacy of the training imparted to the experimental group. Table 35 depicts the outcomes of the revision test-I conducted for the experimental group.

Table 35. Revision Test-I Results of The Experimental Group



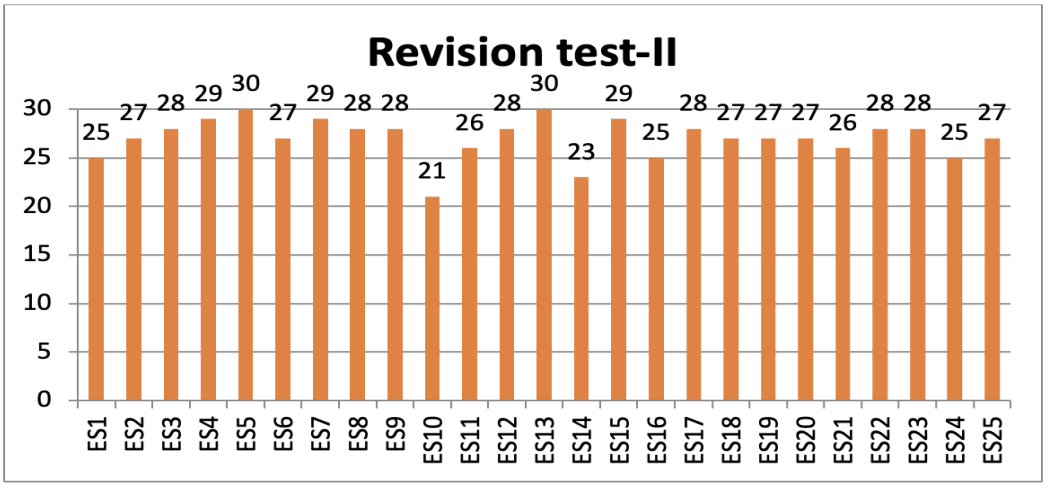
Within the group of control group participants, an examination of the scores revealed a range between 13 and 26, with the uppermost score achieved being 26 and the lowest score achieved being 13 in revision test-II. Table 36 depicts the outcomes of the revision test-II conducted among the participants assigned to the control group.

Table 36. Revision Test-II Results of The Control Group



Two students from experimental group achieved perfect scores of 30 and the minimum score was 21. Consequently, the outcomes of the revision test-II for the experimental group were notably superior to the control group. These findings demonstrate the effectiveness of the training imparted to the experimental group. Table 37 depicts the outcomes of the revision test-II of the experimental group of students.

Table 37. Revision Test-II Results of The Experimental Group



4.2 Analysis of Discourse Analysis

During the analysis of discourse, a focus group consisting of nine students was formed from the experimental group and semi-structured interviews were posed to them. About the VR integrated vocabulary activities, 9 students reported that it was “motivating, useful, efficient, comprehensible, visualizer and thrilling”. The students' views on this theme are as follows:

Students expressed that VR integrated vocabulary teaching activities were motivating.

“I think that these activities have a great impact on motivation.” (ES1)

“Because it is more fun, studying with VR is more enjoyable than studying at home. In terms of motivation, learning something by having fun is motivating.” (ES4)

“First of all, I think it helped us a lot in terms of increasing learning motivation.” (ES15)

“It was more helpful and motivating.” (ES17)

Students found teaching vocabulary with VR useful. Moreover, students stated that they enjoyed learning the words while walking around the classroom.

“It was a useful activity as it is a hands-on training.” (ES4)

“Frankly, I think these activities are very useful for me.” (ES8)

“While writing a paragraph, words that I learned always came to my mind and it was useful for me to use.” (ES15)

“These activities were much more useful.” (ES24)

It is found that teaching vocabulary with VR is efficient. In addition, it enables learning by using the senses of hearing and sight.

"If this training continues in general, I think I can get even more efficiency." (ES1)

"I think the activities are very useful for us in terms of facilitating our learning. So, they were efficient." (ES6)

"I can say that these activities were more efficient." (ES8)

"My friends who learn visually or who learn audibly got more efficiency from this." (ES13)

Thanks to VR, seeing objects in 3D has facilitated vocabulary learning and made words memorable.

"VR goggles were introducing us objects in that environment with visuals and objects such as computers. When I got home and sat at the table, I was remembering when I saw the computer and pronouncing it inside myself." (ES6)

"Because the VR goggles taught by visualizing, the learned words were permanent." (ES12)

"Since we learned by visualization, when I saw that object later, the visual we saw in VR came to my mind." (ES17)

"It was memorable because we saw the meanings of words and objects visually." (ES24)

Vocabulary teaching activities with VR increased the interest in the lesson as they were found fun by the students.

"We learned the words while having fun." (ES4)

"Everyone learned vocabulary with each other in a more fun way." (ES6)

"I observed that even my classmates who did not want to attend the lesson or were not interested participated in the lesson in a more excited way." (ES13)

"It encouraged us to the lesson and created excitement." (ES12)

Doing VR-integrated activities allowed students to interact more with their classmates and teacher.

"When we put on the VR goggles, we were in action and then interacting with our friends to find the words." (ES1)

"It enabled us to interact with my friends and study together." (ES8)

"It provided interactions between friends and with the teacher." (ES12)

"Since we did team activities in the class, it was beneficial for friendship by providing interaction." (ES17)

Students can learn English vocabulary more quickly and with greater interest thanks to VR-integrated vocabulary activities. It is anticipated that this situation will enhance student achievement. According to the data in Table 38, regarding the positive aspects of VR integrated vocabulary teaching activities on promoting learning; six different themes emerged: motivation, usefulness of activities, efficiency, visualization, entertainment and interaction.

Table 38. Positive Aspects of VR Integrated Vocabulary Teaching Activities on Promoting Learning

Theme	Participants	Frequency	Percentage
Motivation	ES1, ES4, ES6, ES8, ES12, ES13 ES15, ES17, ES24	9	100%
Usefulness of activities	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Efficiency	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Visualization	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Entertainment	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Interaction	ES4, ES6, ES8, ES12, ES17	5	55%

About the VR integrated vocabulary activities, 9 students reported that it had positive impacts on "vocabulary retention, vocabulary expansion and comprehension". Learning vocabulary with VR increased vocabulary retention since it includes 3D visuals, authentic content and creates interaction. The students' views on this theme are as follows:

"It is very effective in terms of retention. For example, when I see objects in an environment, the visual and vocabulary meaning I see in virtual reality came to life in my mind." (ES1)

> The impact on retention was very positive. For example, after learning, we took some notes. Visualization and learning in that environment, then talking with our friends and making sentences helped us too. We could remember words directly according to their place and usage. (ES4)

"When we learned with VR, vocabulary retention was better." (ES8)

"The presence of visuals and authentic content definitely increased vocabulary retention." (ES12)

> I think that learning with visual elements with VR goggles made us remember more. And later, when we recalled vocabulary. I think that it was easier to recall and remember the word because the visual in VR came to life in our minds later. That's why I think that learning with VR goggles increases vocabulary retention. (ES13)

Seeing the meaning of words and hearing their pronunciation with VR, as well as seeing objects with 3D visuals enabled learning the words. Thus, activities with VR expanded the students' vocabulary.

"Since it affected visual memory more, it increased vocabulary retention. We wore VR goggles and saw vocabulary meanings on objects and expanded vocabulary more." (ES17)

"I think VR integrated activities really expanded my vocabulary knowledge." (ES1)

"I can say that activities done with VR goggles had positive effects on vocabulary knowledge." (ES6)

"This activity had a positive effect on my vocabulary knowledge, as it remained in my mind visually." (ES15)

"These activities expanded my vocabulary knowledge." (ES17)

Seeing objects in 3D with VR and hearing words' pronunciation made it easier to comprehend words.

"I think we understood words much better with virtual reality." (ES6)

"Repeating words, hearing their pronunciation, seeing them in VR had a positive impact on my understanding." (ES1)

"Since it is supported by visuals, the activities we do with VR are much easier to understand." (ES12)

Hearing the pronunciation of words while learning them with VR made learning native-like pronunciation easier.

"I can remember the word I learned with VR along with its pronunciation." (ES4)

"I could remember the pronunciation of the words we learned with VR. So, I think it has a good impact on pronunciation." (ES6)

"I have come to the conclusion that even my friends who had trouble memorizing words had no difficulty in remembering the correct pronunciation of words later." (ES13)

"I found out that I mispronounced some words and had a chance to correct it." (ES15)

VR integrated vocabulary activities enabled the vocabulary to be remembered with meaning and form as seen in VR goggles, and later on when objects belonging to the learned vocabulary were seen, helped to come to mind in English. Thanks to VR integrated vocabulary activities, students can retain English vocabulary more easily and increase their vocabulary retention. In table 39, the positive aspects of VR integrated vocabulary teaching activities on vocabulary learning and four different themes "retention, vocabulary expansion, comprehension and native-like pronunciation" are shown.

Table 39. Positive Aspects of VR Integrated Vocabulary Teaching Activities on Vocabulary Learning

Theme	Participants	Frequency	Percentage
Vocabulary retention	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Vocabulary expansion	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Comprehension	ES1, ES4, ES6, ES8, ES12, ES13, ES15, ES17, ES24	9	100%
Native-like pronunciation	ES1, ES6, ES12, ES13, ES15, ES17	6	66%

Students who attended VR integrated vocabulary activities English classes stated that VR integrated vocabulary teaching activities helped them learning target language speaking country's culture. In addition, they stated that in VR videos they saw places belongs to the native speakers' environment and their daily life. The students' views on this theme are as follows:

"There were natural products preferred by the local people in the videos. We were able to learn what they use. We also learned what they prefer. It enriched us culturally as it gave this information to us." (ES4)

> I like British English and British culture. I am very curious about their dressing style and their lifestyle. In fact, many things about British culture were shown in the VR videos we watched. We have seen many places such as their restaurants and grocery stores. (ES6)

"I think that we learned British culture and their traditions better." (ES13)

"These activities aroused curiosity in order to further explore British culture." (ES15)

> When we looked around with VR, we saw that they have a different culture. For example, we saw how the order was in the grocery store or what was different in an art gallery and how it was organized. For these reasons, we had a better idea of British culture. (ES17)

Thanks to VR integrated vocabulary activities, students can learn target language speaking country's culture. In table 40, the positive aspects of VR integrated vocabulary teaching activities on learning target language speaking country's culture are given.

Table 40. Positive Aspects of VR Integrated Vocabulary Teaching Activities on Learning Target Language Speaking Country's Culture

Theme	Participants	Frequency	Percentage
Learning target language speaking country's culture	ES4, ES6, ES13, ES15, ES17	5	55%

When students compared VR integrated vocabulary teaching activities with the vocabulary teaching activities done during the foreign language education in the previous years; they stated that previous activities were based on memorization and translation. In addition, some of them told that previous vocabulary teaching activities were boring, based on books and no other materials were used. Moreover, they stated that previous vocabulary activities were boring and based on just MEB curriculum and books. The students' views on this theme are as follows:

"In the previous trainings, teachers only wanted us to write down the Turkish meaning of the word and memorize it." (ES1)

> I've been studying English since kindergarten. And since kindergarten, there were activities based on learning vocabulary. Numbers, animals, colors. For example, we were learning the word dog. Teachers asked us to write this three times, four times, five times. And that didn't change until college. (ES8)

"The methods used to teach vocabulary in the lessons I attended were mostly a learning method that was related to verbal expression by the teacher or memorizing words in our own by reading." (ES13)

> In the past, teachers usually wrote the word. They were saying the meaning. They wanted us to memorize. This was more difficult. Because we didn't see visuals. It's more memorable when we see it. Otherwise, it gets boring. Also, our desire to learn was less. (ES17)

According to table 41, students reported that traditional vocabulary teaching activities were based on "memorization and translation".

Table 41. Traditional Vocabulary Teaching Activities

Theme	Participants	Frequency	Percentage
Memorization	ES6, ES8, ES13, ES15, ES17, ES24	6	66%
Translation	ES1, ES8, ES13, ES17	4	44%

4.3 Discussion

A thorough discussion of the current research is provided in this chapter. The aim of this study is to determine impact of using VR integrated vocabulary teaching activities to increase university students' vocabulary retention and vocabulary learning motivation. This study considered both the qualitative and the quantitative phases to answer the research questions.

4.3.1 Discussion of quantitative phase

With the findings of quantitative phase, the following first research question was answered clearly. The first research question is "Does using VR goggles as an English language vocabulary teaching material have any impact on students' vocabulary retention?". The findings of the current study highlighted the significance of using VR

integrated vocabulary teaching activities to increase students' short-term and long-term vocabulary retention.

Considering the pre and post test results, using VR in English vocabulary teaching has a positive effect on experimental group students' vocabulary acquisition and retention in long run. This point of view respectfully aligns with Vazquez's et al. (2018) study stated in the literature. Vazquez et al. (2018) pointed out that virtual reality promotes vocabulary acquisition in target language. Experimental groups' post-test results are quite higher than control groups' post-test results. The mean percentage of the difference between pre-test and post-test correct answers in the experimental group was found as 53.56% whereas 22.10% in the control group. Post-test results of the experimental group are approximately two and a half times higher than the control group. Therefore, VR integrated vocabulary teaching activities increased students' long-term vocabulary retention. These findings align with Palmeira' et al. findings (2020) stated thanks to the ability to see and interact with virtual items, VR, when used over the long term, increases word retention. Alike, Albayrak et al. (2023) found that using VR increases vocabulary retention. VR integrated activities facilitated the transfer of learned words from short-term memory to long-term memory. Similarly, Koçbuğ (2018) reported that students were better able to transfer knowledge from their short-term to long-term memory and maintain the target vocabulary with the usage of VR technology for education.

When post-test results are analyzed, it was seen that most common vocabulary errors of both group students are in pronunciation. Thus, it can be said that learning pronunciation is challenging for students. Respectively, Gilakjani & Ahmadi's (2011) study pointed out that pronunciation is one of the hardest parts to master for a language learner and one of the least favorite topics for teachers to cover in class. Alike, Susanto's (2021) study indicated that students have troubles pronouncing words. During the lessons pronunciation was thought via IPA to students and asked with IPA symbols during tests. Even though the students were taught IPA, they had trouble remembering the pronunciations. It is difficult to recognize IPA symbols and sounds by students. Similarly, Trazo et al. (2019) reported that some IPA sounds are difficult to recognize by language learners.

Students in both groups answered words that have more than two syllables or phrases wrongly in post-test. So, long words are difficult to learn. This point of view respectfully aligns with Laufer's (1990) study stated that in recognition tasks, longer words produced more mistakes than shorter ones. Hence, long words are more challenging to learn than short ones. Likewise, in study presented by Baddeley et al. (1975) it is stated that when the number of syllables and phonemes are held constant, it is observed that shorter words tend to be more memorable than their longer counterparts. Recalling long words is challenging for students. Hence, length affects word learnability. Similarly, Laufer (1990) stated that the length affects how easy or difficult a word is to learn.

Using VR in English vocabulary teaching has a positive effect on students' vocabulary acquisition and retention in short run, too. Experimental groups' quiz results are quite higher than control groups' quiz results. Quizzes were done after lesson immediately. Teaching vocabulary via VR integrated activities increased vocabulary retention immediately after lesson. Also, experimental group's revision test-I and revision test-II results are higher than control groups' results. Target vocabulary was taught once to the control group via traditional methods. Target vocabulary was not repeated at regular intervals. One of the reasons the control group got low grades in short-term is that vocabulary repetition was not done at regular intervals. These findings respectfully align with Sokmen's (1997) study stated that a word is more likely to remain in long-term memory if it is presented at irregular intervals rather than at gradually longer ones. Even though, target vocabulary was not repeated at regular intervals, experimental group students overachieved. Hence, using VR to teach vocabulary increases vocabulary retention in short run. This point of view respectfully aligns with Madini & Alshaikhi's data (2017) demonstrated that the student's ability to recall vocabulary and hence increase their level of competency was aided by VR.

VR integrated vocabulary teaching was different and unusual for students and it increased vocabulary retention. Also, experimental group's students took the input first, then they produced the output. This process helped them to retain vocabulary. Similarly, Kitajima (2001) found that compared to the input-dominant condition, the output condition assisted

students in encoding the language into their memory. Experimental students explored the vocabulary in virtual environment by themselves. This allowed them to retain vocabulary. Likewise, Freina & Ots' study (2015) found that VR can provide some advantages by allowing physical exploration of objects that are not actually accessible, helping students better understand and memorize them.

4.3.2 Discussion of qualitative phase

With the findings of qualitative phase, the following second research question was answered clearly. The second research question is "What are students' views about using VR goggles to enhance their English language vocabulary learning motivation?". The current research's results underscored the significance of employing VR-assimilated vocabulary instruction activities as a means of advancing learning outcomes, enhancing vocabulary retention, increasing vocabulary learning motivation, and imparting knowledge on target language speaking country's culture. When students compare t traditional vocabulary teaching and VR integrated vocabulary teaching, they said that traditional vocabulary teaching includes rote learning and translation technique.

4.3.2.1 VR integrated vocabulary teaching activities on promoting learning

Considering discourse analysis results all students in the focus group stated that VR integrated vocabulary teaching increased their vocabulary learning motivation. This point of view respectfully aligns with Harris & Reid's (2005) pointed out that practicing with VR has the potential to be an effective intervention tool because it is a motivating activity. Our findings consistent with Harris & Reid that using VR technology increased students' vocabulary learning motivation. Hsu (2020) mentioned that VR assisted teaching improves the students' motivation and effectiveness. Similarly, Peixoto et al. (2019) found that according to foreign language teachers, using VR technology can boost students' learning curves and help inspire them.

VR integrated vocabulary teaching was found motivating by students because they expressed that it was useful, efficient, supported with visuals, thrilling and made interaction possible. Likewise, Huang et al. (2021) stated that VR immersion is

motivating, engaging, and supportive of learning. Alike, Mei & Sheng (2011) discovered that using VR technology in the classroom promotes involvement and immersion in the material, creating a compelling atmosphere that can motivate and pique students' interests. When students have fun, their anxiety became lower. This also helped increasing vocabulary learning motivation. These findings align with Huang et al.'s (2021) study. The latter study found that VR technologies have been found to be efficacious in mitigating learning anxiety. Similarly, Melchor-Couto (2016) stated that virtual worlds had a favorable impact on some students, who indicated that their self-confidence grew and their anxiousness decreased. So, virtual worlds are described as low-anxiety environments.

All students expressed that VR integrated vocabulary teaching provided instruction supported with visuals. In a similar regard, Nemec et al. (2017) maintained that VR presents significant potential benefits in the realm of education since it makes it possible to envision both actual and made-up scenarios, giving access to previously inaccessible locations. Students also stated that visualization helped them to retain vocabulary and increase vocabulary learning motivation. Hence, using VR to teach vocabulary promotes English vocabulary teaching as it is supported by visuals and enables the mental representation. Chen et al. (2020) similarly found that the mental representation of the target words can be strengthened by watching VR videos, which also make it easier to understand word usage in context and increase one's knowledge of English vocabulary. Likewise, Acar & Cavus (2020) found that the students' English skills improved thanks to VR's close-to-realistic visuals. VR integrated teaching provided learning with visuals.

Also, students heard the sentences, walked around the classroom, exposed to the target language, thought logically, explored the virtual environment by themselves and interacted with classmates. Hence, students with different learning styles participated to the lesson. This because virtual reality allowed use of brain-based learning. Virtual reality has the capacity to engage multiple sensory modalities concurrently, encompassing sight, sound, and touch. In the context of acquiring new vocabulary within the context of virtual reality, students are afforded the opportunity to visually observe and interact with objects and environments, acoustically perceive native speakers pronouncing words, and

physically engage with the virtual world. The culmination of this multi-sensory experience fosters greater vocabulary retention. This learning process also increased the motivation of the students. Alike, Salem's (2017) findings showed that using brain-based learning approach to teach vocabulary increased vocabulary retention as well as increasing motivation. Similarly, Ciftpınar (2012) maintained that using brain-based learning fostered a highly productive learning environment and increased vocabulary retention.

By utilizing brain-based instructional approach with VR to teach vocabulary, students had the potential to enhance the learning process, encourage active participation, and cultivate a more profound comprehension of unfamiliar terms. It is because students felt themselves in virtual environment. When students experienced a sense of presence, their cognitive abilities were heightened, resulting in increased receptiveness towards the learning process. This, in turn, led to a greater capacity for retaining vocabulary. In this way, students learned better than traditional methods. Likewise, Gozuyesil and Dikici (2014) stated that using brain-based learning strategies resulted in superior academic achievement in comparison to the implementation of conventional pedagogical techniques.

Incorporating movement with VR experience improved focus and concentration. The use of a technique involving physical movement in the classroom environment during learning activities enabled the use of students' kinesthetic intelligence. This finding aligns with Vazquez et al. (2018) stated that use of virtual reality had the potential to significantly influence the acquisition of language, primarily through the incorporation and use of kinesthetic elements. In this way, students had fun while learning. All students expressed that using VR in vocabulary teaching is entertaining and it increased their participation to the lesson. As VR integrated vocabulary teaching is a fun activity, it promotes vocabulary learning. Similarly, Ashraf et al. (2014) stated that the association between words and other lexical items can be established through enjoyable activities to aid in the development of a vocabulary network.

More than half of the students expressed that VR integrated vocabulary teaching allowed interaction with the context, classmates and teacher. These findings respectfully align with Parmaxi's (2020) study. Parmaxi (2020) demonstrated that VR fosters interaction. Students expressed that thanks to interaction VR allowed, they were active in the lesson. Similarly, Hedberg & Alexander (1994) maintained that thanks to the natural three-dimensionality of the interface and its interaction with the environment, the learner cannot play a passive role in the interaction.

4.3.2.2 VR integrated vocabulary teaching activities on vocabulary learning

Considering discourse analysis results all students in the focus group stated that VR integrated vocabulary teaching increased their vocabulary retention. Thanks to VR integrated vocabulary teaching students learned and retained vocabulary better. Likewise, Tai et al.'s (2020) study found that the VR app helped EFL learners learn and remember vocabulary in a way that considered word meaning and context. Also, Koçbuğ (2018) stated that VR integrated vocabulary teaching increased vocabulary retention. Increasing vocabulary retention allowed to improve vocabulary expansion. All students expressed that VR integrated vocabulary teaching activities improved their vocabulary expansion. Similarly, Li et al. (2022) found that vocabulary input from the VR experience helped improve vocabulary acquisition and improve vocabulary.

Moreover, all students expressed that VR integrated vocabulary teaching made it easy to comprehend vocabulary. Thus, the academic achievement of the students increased. This finding aligns with Acar & Cavus (2020) study. Acar & Cavus maintained that the academic success of the students was enhanced via VR-based English instruction. Calli, et al. (2020) stated the sense of hearing and sight is already broadly used in virtual reality. Similarly, students expressed that they saw the forms of words, read their meanings, heard their pronunciations thanks to VR, and therefore comprehended the words better. Students comprehend the vocabulary better since VR allowed use of 5 senses and personally involved in the learning process. Alike, Ord (2012) maintained that active engagement is key to effective learning.

In addition, most of the students expressed that VR integrated vocabulary teaching facilitated native-like pronunciation. Alike, Alemi & Khatoony (2020) recommended that virtual reality could be used to improve EFL students' pronunciation abilities and aid in the development of native-like pronunciation. Similarly, Na et al. (2020) believed that through the usage of such VR application, students are expected to improve their English pronunciation through the use of such a VR application.

4.3.2.3 VR integrated vocabulary teaching activities on learning target language speaking country's culture

Most of the students in the focus group explained that VR integrated vocabulary teaching enabled them to learn about target language speaking country's culture. In line with the literature, Kessler (2018) stated that through the use of virtual reality, students can practice culturally relevant tasks in ways that wouldn't otherwise need travel, immersing them in the culture of the target language. Hence, VR integrated vocabulary activities enables learning the culture. Similarly, Berti (2021) indicated that since these fully immersive experiences allow students to navigate authentic and contextualized environments, concentrate on what interests them, and experience the authentic target culture outside of the classroom, VR has a lot of potential for helping students learn foreign languages and about other cultures.

4.3.2.4 Comparison of VR integrated and traditional vocabulary teaching

According to the students in the focus group, traditional vocabulary teaching activities done in previous years were based on memorization and translation. These traditional vocabulary activities were fill-in-the-blank, grammar teaching, translation or matching activities. These findings respectfully align with Folse's study (2006) maintained that fill-in-the-blanks activities are passive use of the vocabulary. Similarly, Walia (2012) indicated that students mostly rely on grammar rules while writing and translate them from their native tongue, whereas "grammar translation method produces habits that show deciphering rather than reading" when reading. Students explained that teacher was explaining the meaning in their mother language and they were passive. Alike, Dong (2016) stated that students are seated there passively taking the knowledge while the

teacher lectures about the English knowledge and grammar structure of the text or exam skills.

VR integrated vocabulary teaching is a new method used by researcher and it is found that VR integrated vocabulary teaching is more beneficial for students than traditional activities. Similarly, Hu-Au & Lee (2017) stated it could push the limits of the conventional classroom to make it more interesting, innovative, and student-centered. In a nutshell, VR has a positive effect on students' vocabulary learning. These findings respectfully align with Koçbuğ's study (2018) maintained that VR tools have positive impact on students' vocabulary learning.

CHAPTER 5. CONCLUSION AND SUGGESTIONS

The current study was undertaken to address the gaps identified within the existing body of literature. Few studies focused on vocabulary teaching with VR. Therefore, extended readings were made along with consultations from subject-matter experts to shape the current study paper. Afterwards, VR goggles were examined to decide the proper ones to conduct lessons with.

The principal aim of the research was to ascertain the effect of VR incorporated in vocabulary instruction on the retention of vocabulary and the vocabulary learning motivation. The relevant literature was consulted to obtain information about the use of VR in education. It has been observed that VR is used in education in some parts of the world. It has been learned that this area is newer and less common in Turkey than in the world. Students took education with VR for the first time in their lives. Therefore, vocabulary teaching activities with VR were carefully studied and implemented.

In the study, 47 students from an English preparatory school at a foundational university voluntarily participated. Vocabulary was taught to the experimental group consisting of 25 participants with VR integrated activities, the same vocabulary was taught to the control group consisting of 22 participants with traditional teaching methods. A pre-test was applied to determine the readiness of both groups for the 80 target words which were taught throughout the study. Pre-test results indicated that the levels of the students in the two groups were similar.

Every week for a duration of 8 weeks, the target 10 words were taught to the experimental group with VR-integrated activities and to the control group in a traditional method. A quiz was applied after the lesson in which vocabulary was taught to both groups for 8 weeks. As a result of 8 quizzes were applied to determine the results from both experimental and control groups. It was determined that the quiz results of the experimental group, which was taught vocabulary with VR, were quite high. Revision

tests were applied in the 5th and 9th weeks. As a result of the revision tests, the experimental group got higher scores.

After 8 weeks, the vocabulary teaching process was over and no activity related to the target 80 words was done. In the 15th week, the same pre-test was applied to the students as the post-test. As a result, it was discovered that the experimental group outperformed the control group by a factor of 2.5. Semi-structured interviews with members of the focus group were done after the post-test.

During the process, the control group students were taught the target words by doing traditional activities with power-points and flashcards. It was observed that the students were not very interested in the lesson and did not make an extra effort to do the activities. Therefore, the tests and quizzes determined that the grades of the control group students were quite low compared to the experimental group students. The reason for this is the use of traditional vocabulary teaching activities to teach target words to control group students. Experimental group students explained that traditional vocabulary teaching activities were not enough to learn. The findings took a step forward in addressing shortcomings of traditional vocabulary teaching activities. According to the students, traditional vocabulary teaching activities are based on memorization and translation. When students compared VR with traditional vocabulary teaching activities, they stated that learning with VR was better.

As stated at the beginning of this chapter, the primary purpose of this study was to identify the impact of using VR integrated vocabulary teaching activities on vocabulary retention. Students received training with VR for the first time. As a result of the study, it was found that teaching vocabulary with VR has a positive effect on short-term and long-term vocabulary retention. The test and quiz results of the experimental group students are much higher than the control group. After teaching vocabulary with VR, the students were able to retain the target words immediately after the lesson, a few weeks and a few months later. Because VR integrated vocabulary teaching includes 3D visuals and sound. Students hear the pronunciation, see real-life like visuals and walk around. Hereby, more senses come into play. This allows to words to be remembered more.

Words that have more than two syllables or phrases in post-test were generally answered incorrectly in post-test by both groups. So, it can be said that long words were hard to remember. Still, the experimental group made fewer mistakes. Also, to evaluate the learning of pronunciation IPA symbols were taught and target words' IPA spelling was asked during the tests. Students could not remember all of the symbols and answered most of the questions about pronunciation incorrectly. Normally, they could pronounce the word verbally. So, teaching IPA symbols are challenging and it takes time and more practice to teach.

The next purpose of this study was to identify the impact of using VR integrated vocabulary teaching activities on vocabulary learning motivation. Students' views on VR-integrated and traditional vocabulary teaching activities were learned. The findings pointed out that VR integrated vocabulary teaching has a positive effect on vocabulary retention and vocabulary learning motivation in the short and long term. While doing the activities with VR, students attended the lesson very carefully and willingly. They executed every instruction given. Students explained that thanks to VR, their willing and careful participation in the lesson made it easier for them to learn and remember words.

Words in the target language can be easily learned using VR. Students expressed that VR increased productivity, interaction, vocabulary expansion and facilitated native-like pronunciation. Students can use the words they learn through the VR experience to form sentences. They can interact with classmates and the teacher through activities done with VR. The use of the target vocabulary is increased thanks to the increase in productivity and interaction made possible by VR. In this way, VR helped to expand the vocabulary. Students heard the pronunciation of words thanks to the VR experience and reinforced the pronunciation with the activities done.

VR experience gives students a chance to see the usage of target language's vocabulary in a real-life setting, due to the fact that experience is backed up by 3D visuals. The students reported that utilizing VR to learn vocabulary is considerably better as it is supported by visuals. The students also said that VR makes it possible to learn target

language speaking country's culture as it is supported by 3D visuals from real-life setting. In short, as VR is supported by real-life visuals, it facilitates the learning of vocabulary in the target language and enables learning culture.

It's important to be highly motivated when learning something new. At the same time, the fact that the learning process is fun motivates people. Conducting vocabulary lesson activities with VR increases student motivation to learn vocabulary and makes lessons fun. This makes the process of learning target words easier. Students said that VR integrated vocabulary activities increased their motivation to study vocabulary and it was engaging. In addition, the students indicated that these activities were useful. Vocabulary teaching activities using VR are useful since they make learning faster and easier. Thanks to the learned words, students can use target words in their daily life.

Incorporation of principles based on brain-based learning into vocabulary instruction with virtual reality technology can potentially transform the delivery of language education. The significant impact of brain-based learning on vocabulary teaching is evident through the implementation of strategies that are congruent with the natural processes of language acquisition and vocabulary retention in the brain. By harnessing the power of virtual reality and implementing brain-based learning approach, instructors possess the capacity to generate captivating, impactful, and efficacious vocabulary instruction opportunities that address the requirements of students. Using brain-based approach with virtual reality technology increased vocabulary retention as well as vocabulary learning motivation and culminated in enhanced linguistic and communicative proficiencies among students.

When learning a new language, the comprehensibility of the given inputs facilitates the learning process. Giving comprehensible input in language learning process is very important for learning to take place. Students stated that the learning process became more understandable through the vocabulary teaching activities with VR. With VR integrated vocabulary teaching activities, the learning process becomes comprehensible. As a result, the use of VR integrated vocabulary teaching activities in vocabulary teaching has many positive results.

This study paved the way for many future studies to determine the role of VR in vocabulary teaching. This part explains the implications for further research. Researchers

conducting studies within the scope of VR vocabulary teaching can consider the mentioned points.

In this study, target vocabulary with all their aspects were taught through VR integrated activities. To start with, the most difficult aspect to learn was pronunciation. The students had no difficulty pronouncing the words while uttering them. However, they had trouble recognizing the pronunciation with IPA symbols. It is recommended to teach IPA symbols before conducting vocabulary teaching activities with VR in future language lessons. In addition, after teaching vocabulary with VR, students were given tasks such as preparing posters, making presentations, and writing short paragraphs using target words. Doing various activities using target words after teaching vocabulary with VR will increase efficiency for further research. Lastly, the current research focused only on teaching vocabulary with VR. Future research may focus on teaching listening, speaking, reading, writing, and grammar with VR.

This study was conducted at a foundational university in Istanbul. The same study can be done again by reaching more students across the countries to broaden the data and the results in the topic. In addition, further research advised to include participation from public-school universities. Moreover, the current study was conducted with only 12 VR goggles due to the prices. However, in the classrooms there were 22 and 25 students. So, students used VR goggles alternatively. Therefore, having VR goggles as much as the number of students in the classroom where vocabulary is taught with VR will speed up the lesson processing time and increase efficiency for further research.

The current study was conducted by choosing 80 words as the target vocabulary to teach throughout the study. The same study can be done again with more target vocabulary. Furthermore, in this study ready-made 3D videos from YouTube were used. Further researchers can consider develop 3D materials about the target topics and vocabulary. Finally, teaching vocabulary with VR was done once a week in a lesson. In the further research, vocabulary can be taught with VR a few lessons per week.

REFERENCES

Acar, A., & Cavas. B., (2020). The effect of virtual reality enhanced learning environment on the 7th-grade students' reading and writing skills in English. *Malaysian Online Journal Of Educational Sciences. 8*(4). 22-33.

Albayrak, M. S., Chen, J., & Williams, P. J. (2023). A quantitative research on gamifying vocabulary acqisition and retention in virtual reality. *Teaching English with Technology, 23*(1). https://doi.org/10.56297/BKAM1691/DFXC4759

Alcaide-Martínez, M., & Taillefer, L. (2022). Gamification for English language teaching: A case study in translation and interpreting. *Lebende Sprachen*, *67*(2), 283-310. https://doi.org/10.1515/les-2022-1015

Alemi, M., & Khatoony, S. (2020). Virtual reality assisted pronunciation training (VRAPT) for young EFL learners. *Teaching English with Technology*, *20*(4), 59-81.

Allcoat D., & von Mühlenen A. (2018). Learning in virtual reality: Effects on performance, emotion and engagement. *Research in Learning Technology, 26.* https://doi.org/10.25304/rlt.v26.2140

Almaki, S., (2016). Integrating quantitative and qualitative data in mixed methods research—challenges and benefits. *Journal of Education and Learning. 5*(3). 228-296. http://dx.doi.org/10.5539/jel.v5n3p288

Ambarwati, R. & Mandasari, B. (2020). The influence of online cambridge dictionary toward students' pronunciation and vocabulary mastery. *Journal of English Language Teaching and Learning. 1*(2).

AR VR EDTECH. (2022). What are 3 types of virtual reality? - virtual reality on education. Retrieved October 01, 2022, from https://arvredtech.com/blogs/news/what-are-3-types-of-virtual-reality-virtual-reality-on-education

Asaad, R. R. (2021). Virtual reality and augmented reality technologies: A closer look. *Virtual reality*, *1*(2). 1-10. https://doi.org/10.5281/zenodo.5652297

Ashraf, H. Ghanei, M. F. & Salamic, M. (2014). The impact of online games on learning english vocabulary by Iranian (low-intermediate) efl learners, *Article in Procedia - Social and Behavioral Sciences*. 286-287 doi:10.1016/j.sbspro.2014.03.418

Asyiah, D. (2017). The vocabulary teaching and vocabulary learning: perception, strategies, and influences on students' vocabulary mastery. *Jurnal Bahasa Lingua Scientia*, *9*(2), 293-318. https://doi.org/10.21274/ls.2017.9.2.293-318

Baddeley, A. D., Thomson, N., & Buchanan, M. (1975). Word length and the structure of short-term memory. *Journal of Verbal Learning and Verbal Behavior, 14*(6), 575–589. https://doi.org/10.1016/S0022-5371(75)80045-4

Balcı, Ö. & Çakır, A. (2012). Teaching vocabulary through collocations in EFL Classes: The case of Turkey. *International Journal of Research Studies in Language Learning. 1*(1). 21-32. https://doi.org/10.5861/IJRSLL.2012.V1I1.31

Basal, A., & Aytan, T. (2014). Using Web 2.0 tools in English language teaching. *ICT For Language Learning*. 372-375

Basten, D. (2017). Gamification. *IEEE Software*, *34*(5), 76–81. doi:10.1109/ms.2017.3571581

Berryman, D. R. (2012). Augmented reality: a review. *Medical reference services quarterly*, *31*(2), 212-218. https://doi.org/10.1080/02763869.2012.670604

Berti, M. (2021). The unexplored potential of virtual reality for cultural learning. The Eurocall Rewiev. 29(1). 60-67. https://doi.org/10.4995/eurocall.2021.12809

Brown, A. (2012). International phonetic alphabet. *The encyclopedia of applied linguistics*. https://doi.org/10.1002/9781405198431.wbeal0565

Bintz, W. P. (2011). Teaching vocabulary across the curriculum. *Middle School Journal*, *42*(4), 44-53. https://doi.org/10.1080/00940771.2011.11461773

Caine, R. N., & Caine, G. (1994). *Making connections: Teaching and the human brain*. New York: Addison-Wesley.

Calli, Y., Pillai, A., & Atabey B. E., (2020). Senses on virtual reality. *Emerging Technology Adoption and Use.* 142-157

Castillo-Cuesta, L. (2020). Using digital games for enhancing efl grammar and vocabulary in higher education. *International Journal of Emerging Technologies in Learning (iJET), 15*(20), 116-129. Kassel, Germany: International Journal of Emerging Technology in Learning. Retrieved March 2, 2023 from https://www.learntechlib.org/p/218312/.

Chen, C., Hung, H. T., & Yeh, H. C., (2020). Virtual reality in problem-based learning contexts: Effects on the problem-solving performance, vocabulary acquisition and motivation of English language learners. *Journal of Computer Assisted Learning.* 851-860. https://doi.org/10.1111/jcal.12528

Chen, Y. (2016). The effects of virtual reality learning environment on student cognitive and linguistic development. *Springer. 25.* 637-646. https://doi.org/10.1007/s40299-016-0293-2

Cheng, Y. H., & Good, R. L. (2009). L1 Glosses: Effects on EFL Learners' Reading Comprehension and Vocabulary Retention. *Reading in a Foreign Language*, *21*(2), 119-142.

Ciftpınar, B. (2012). Brain-based construct approach in second language learning. *Elementary Education Online. 11*(1), 107-117.

Constantinescu, A. I. (2007). Using technology to assist in vocabulary acquisition and reading comprehension. *The Internet TESL Journal*, *13*(2), 122-133.

Cowan, N. (2008). What are the differences between long-term, short-term, and working memory?. *Progress in brain research*, *169*, 323-338. https://doi.org/10.1016/S0079-6123(07)00020-9

Creswell, J. W. (2009). Research designs: Qualitative, quantitative, and mixed methods approaches. *Callifornia: Sage*.

Dehganzadeh, H., & Dehganzadeh, H. (2020). Investigating effects of digital gamification-based language learning: a systematic review. *Two Quarterly Journal of English Language Teaching and Learning University of Tabriz, 12*(25), 53-93. https://dx.doi.org/10.22034/elt.2020.10676

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., & Dixon, D. (2011). Gamification. using game-design elements in non-gaming contexts. *Proceedings of the 2011 Annual Conference Extended Abstracts on Human Factors in Computing Systems - CHI EA '11*. doi:10.1145/1979742.1979575

Dong, X. (2016). Research on the teaching methods of college English. *Creative Education, 7*(9), 1233-1236. http://dx.doi.org/10.4236/ce.2016.79129

Dörnyei, Z. (2007). Research Methods in Applied Linguistics. London: Oxford University Press.

E Shaw, S., & Bailey, J. (2009). Discourse analysis: what is it and why is it relevant to family practice?. *Family practice, 26*(5), 413-419. https://doi.org/10.1093/fampra/cmp038

Efendi, F., Kurniati, A., Bushy, A., & Gunawan, J. (2019). Concept analysis of nurse retention. *Nursing & health sciences, 21*(4), 422-427. https://doi.org/10.1111/nhs.12629

Elmqaddem, N., (2019). Augmented reality and virtual Reality in education. myth or reality?. *International Journal of Emerging Technolohies in Learning. 14*(3). 234-242 https://doi.org/10.3991/ijet.v14i03.9289

Eren, O. (2015). Vocabulary Learning on Learner-Created Content by Using Web 2.0 Tools. *Contemporary Educational Technology. 6*(4). 281-300.

Erol, H., (2021) Reflections on the 21st century skills into the curriculum of social studies course. *International Journal of Education & Literacy Studies, 9*(2), http://dx.doi.org/10.7575/aiac.ijels.v.9n.2p.90

Folse, K. S., (2006). The effect of type of written exercise on L2 vocabulary retention. *TESOL Quarterly*, *40*(2), 273-293. https://doi.org/10.2307/40264523

Folse, K. K., (2008). Six vocabulary activities for the english language classroom. *English Teaching Forum. 46*(3), 12-21.

Freina, L. & Ott. M. (2015). 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*. *1*(133). 1000-1007

Gathercole, S. E., Hitch, G. J., & Martin, A. J. (1997). Phonological short-term memory and new word learning in children. *Developmental psychology*, *33*(6), 966. https://psycnet.apa.org/doi/10.1037/0012-1649.33.6.966

Gathercole, S. E., & Masoura, E. V. (2005). Contrasting contributions of phonological short-term memory and long-term knowledge to vocabulary learning in a foreign language. *Memory*, *13*(3-4), 422-429. https://doi.org/10.1080/09658210344000323

Geisinger, K. F. (2016). 21st century skills: what are they and how do we assess them? *Applied Measurement in Education, 29*(4), 245–249. doi:10.1080/08957347.2016.1209207

Gilakjani, A. P., & Ahmadi, M. R. (2011). Why is pronunciation so difficult to learn?. *english language teaching*, *4*(3), 74-83. doi:10.5539/elt.v4n3p74

Gozuyesil, E., & Dikici, A. (2014). The effect of brain based learning on academic achievement: A Meta-Analytical Study. *Educational Sciences: Theory and Practice, 14*(2), 642-648. doi: 10.12738/estp.2014.2.2103

Haar, J., Hall, G., Schoepp, P., & Smith, D. H. (2002). How teachers teach to students with different learning styles. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 75*(3), 142–145. https://doi.org/10.1080/00098650209599254

Hajebi, M., Taheri, S., Fahandezh, F., & Salari, H. (2018). The role of web-based language teaching on vocabulary retention of adult pre-intermediate EFL learners. *Journal of Language Teaching and Research*, *9*(2), 372-378. http://dx.doi.org/10.17507/jltr.0902.20

Halim, M. S. A. A., & Hashim, H. (2019). Integrating web 2.0 technology in ESL classroom: A review on the benefits and barriers. *Journal of Counseling and Educational Technology*, *2*(1), 19-26. https://doi.org/10.32698/0381

Harlinda, N. (2019). *Students' perceptions in using youtube as media for learning English as a foreign language* (Publication No. 1401120961) [Undergraduate thesis, IAIN Palangka Raya]

Harris, K., & Reid, D. (2005). The influence of virtual reality play on children's motivation. *Canadian journal of occupational therapy*, *72*(1), 21-29. https://doi.org/10.1177/000841740507200107

Hashemzadeh, M. (2012). The effect of exercise types on EFL learners' vocabulary retention. *Theory and Practice in Language Studies*, *2*(8), 1716-1727. doi:10.4304/tpls.2.8.1716-1727

Haslam, M. (2018). Parts of Speech. *The TESOL Encyclopedia of English Language Teaching*, 1-8. https://doi.org/10.1002/9781118784235.eelt0088

Hastings, A. (2000). Discourse analysis: what does it offer housing studies?. *Housing, Theory and Society*, *17*(3), 131-139. https://doi.org/10.1080/14036090051084441

Hedberg, John; Alexander, Shirley (1994). Virtual reality in education: defining researchable issues. *Educational Media International, 31*(4), 214–220. https://doi.org/10.1080/0952398940310402

Howgego, J. (2020, Junary 29) What is reality? *Why we still don't understand the world's true nature.* New scientist. https://www.newscientist.com/article/mg24532670-700-what-is-reality-why-we-still-dont-understand-the-worlds-true-nature/

Hsu, Y. C. (2020). Exploring the learning motivation and effectiveness of applying virtual reality to high school mathematics. *Universal Journal of Educational Research*, *8*(2), 438-444. doi: 10.13189/ujer.2020.080214

Huang, W., Roscoe, R. D., Johnson-Glenberg, M. C., & Craig, S. D. (2021). Motivation, engagement, and performance across multiple virtual reality sessions and levels of immersion. *Journal of Computer Assisted Learning*, *37*(3), 745-758. https://doi.org/10.1111/jcal.12520

Hu-Au, E., & Lee, J. J. (2017). Virtual reality in education: a tool for learning in the experience age. *International Journal of Innovation in Education*, *4*(4), 215-226. https://doi.org/10.1504/IJIIE.2017.091481

Hummel, K. M. (2010). Translation and short-term L2 vocabulary retention: hindrance or help? *Language Teaching Research*, *14*(1), 61–74. https://doi.org/10.1177/1362168809346497

Hussein, M., & Nätterdal, C. (2015). The benefits of virtual reality in education-A comparision Study. *GUPEA.*

Icten, T. & Bal, G. (2017). Content analysis of academic studies on augmented reality technology. *Information Technologies Journal. 10*(4). Doi: 10.17671/gazibtd.290253

Ivankova, N. V., Creswell, J. W., & Stick, S. L. (2006). Using mixed-methods sequential explanatory design: From theory to practice. *Field methods*, *18*(1), 3-20. https://doi.org/10.1177/1525822X05282260

Izard, S. G., Juanes Méndez, J. A., & Palomera, P. R. (2017). *Virtual Reality Educational Tool for Human Anatomy. Journal of Medical Systems, 41(5).* doi:10.1007/s10916-017-0723-6

Isnaini, S., & Aminatun, D. (2021). Do you like listening to music?: students' thought on their vocabulary mastery using English songs. *Journal of English Language Teaching and Learning*, *2*(2), 62-67.

Ismailova, H. & Feruza, T. (2021). The importance of teaching vocabulary. *Journal of Foreign Languages and Linguistics, 2*(3).

Kacani, L., & Cyfeku, J. (2015). Developing EFL vocabulary through speaking and listening activities. *Academic Journal of Interdisciplinary Studies.* 4(3), 390-394. doi:10.5901/ajis.2015.v4n3s1p390

Kaya, F. B. (2019). *Teachers' opinions on the use of virtual reality applications in education* (Publication No. 543276). [Master's thesis, Bahcesehir University]. https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Kenwright, B. (2019). Virtual reality: Where have we been? where are we now? and where are we going?. https://doi.org/10.20944/preprints201907.0130.v1

Kessler, G. (2018). *Technology and the future of language teaching.* Foreign Language Annals, *51*(1), 205–218. doi:10.1111/flan.12318

Khoii, R., & Sharififar, S. (2013). Memorization versus semantic mapping in L2 vocabulary acquisition. *ELT Journal, 67*(2), 199–209. https://doi.org/10.1093/elt/ccs101

Kırmızı, Ö & Kömeç B. (2019). The impact of the flipped classroom on receptive and productive vocabulary learning. *Journal of Language and Linguistic Studies, 15*(2), 437-449. http://dx.doi.org/10.17263/jlls.586096

Kilickaya, F. & Krajka, J. (2010). Teachers' technology use in vocabulary teaching. *Journal Articles; Reports – Research.* 81-86.

Kocbug, R. (2018). *The effectiveness of virtual reality tools on vocabulary learning and retention.* (Publication No. 511320) [Master's dissertation, Istanbul University]. https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp

Koivisto, J. and Hamari, J. (2019) The rise of motivational information systems: a review of gamification research. *International Journal of Information Man- agement, 45,* 191–200. doi: 10.1016/j.ijinfomgt.2018.10.013

Konstantinidis, A., Theodosiadou, D., & Pappos, C. (2013). Web 2.0 tools for supporting teaching. *Turkish Online Journal of Distance Education*, *14*(4), 287-295.

Kitajima, R. (2001). The effect of instructional conditions on students' vocabulary retention. *Foreign Language Annals, 34*(5), *470–482.* doi:10.1111/j.1944-9720.2001.tb02086.x

Laufer, B. (1990). Why are some words more difficult than others?—Some intralexical factors that affect the learning of words. *International Review of Applied Linguistics in Language Teaching, 28*(4). 293-307. https://doi.org/10.1515/iral.1990.28.4.293

Li, Y., Ying, S., Chen, Q., & Guan, J. (2022). An experiential learning-based virtual reality approach to foster students' vocabulary acquisition and learning engagement in English for geography. *Sustainability*, *14*(22), 15359. https://doi.org/10.3390/su142215359

Lin, C. H., Lin, H. C., Chen, C. Y., & Lih, C. C. (2022). Variations in intraocular pressure and visual parameters before and after using mobile virtual reality glasses and their effects on the eyes. *Scientific Reports*, *12*(1), 1-12. https://doi.org/10.1038/s41598-022-07090-x

Lin, T. J., & Lan, Y. J. (2015). Language learning in virtual reality environments: Past, present, and future. *Journal of Educational Technology & Society*, *18*(4), 486-497.

Luckin, R., Clark, W., Graber, R., Logan, K., Mee, A., & Oliver, M. (2009). Do Web 2.0 tools really open the door to learning? Practices, perceptions and profiles of 11–16-year-old students. *Learning, Media and Technology, 34(2), 87–104.* doi:10.1080/17439880902921949

Lum, H. C., Elliott, L. J., Aqlan, F., & Zhao, R. (2020). Virtual reality: history, applications, and challenges for human factors research. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 64*(1), 1263–1268. doi:10.1177/1071181320641300

Madini, A. A., & Alshaikhi, D. (2017). Virtual reality for teaching esp vocabulary: a myth or a possibility. *International Journal of English Language Education, 5*(2), 111-126. https://doi.org/10.5296/ijele.v5i2.11993

Mantri, A., Nandi, S., Kumar, G., & Kumar, S., (2011). *High performance architecture and grid computing.* Springer.

Martirosov, S., & Kopecek, P. (2017). Virtual reality and its influence on training and education-literature review. *28th Daaam International Symposıum On Intelligent Manufacturing And Automation.* doi: 10.2507/28th.daaam.proceedings.100

Mei, H. H., & Sheng, L. S. (2011). Applying situated learning in a virtual reality system to enhance learning motivation. *International journal of information and education technology*, *1*(4), 298-302.

Melchor-Couto, S. (2016). Foreign language anxiety levels in Second Life oral interaction. *ReCALL*, *29*(01), 99–119. https://doi.org/10.1017/S0958344016000185

Milgram, P. & Kishino, F, (1994), A taxonomy of mixed reality visual displays. *IEICE Transactions on Information Systems. E77-D*(12). 1–15

Mondria, J. (2003). The effects of inferring, verifying, and memorizing on the retention of l2 word meanings. *Cambridge University Press. 25*(4). 473-499. https://doi.org/10.1017/S0272263103000202

Morgan, H. (1996). An analysis of Gardner's theory of multiple intelligence. *Roeper Review*, *18*(4), 263-269. https://doi.org/10.1080/02783199609553756

Na, K. S., Mohamed, F., Isham, M. I. M., Siang, C. V., Tasir, Z., & Abas, M. A. (2020) Virtual reality application integrated with learning analytics for enhancing english pronunciation: A conceptual framework. In *2020 IEEE Conference on e-Learning, e-Management and e-Services.* 82-87 doi: 10.1109/IC3e50159.2020.9288478

Nation, P. (1994). *New ways in teaching vocabulary. new ways in tesol series: innovative classroom techniques*. Washington: TESOL

Nemec, M., Fasuga, R., Trubac, J., & Kratochvil, J. (2017). Using virtual reality in education. *2017 15th International Conference on Emerging eLearning Technologies and Applications (ICETA).* 1-6. https://doi.org/10.1109/ICETA.2017.8102514

Nontasee, W., & Sukying, A. (2021). The learnability of word knowledge aspects in Thai EFL high school learners. *Journal of Language and Linguistic Studies, 17*(1), 34-55. Doi: 10.52462/jlls.3

North, M. M., & North, S. M. (2016). A comparative study of sense of presence of traditional virtual reality and immersive environments. *Australasian Journal of Information Systems*, *20*.

Ord, J. (2012). John Dewey and Experiential Learning: Developing the theory of youth work. *Youth & Policy*, *108*(1), 55-72.

Ökmen, B., & Kilic, A. (2016). The effect of language teaching methods on academic success in Turkey. *Journal of Education and Training Studies*, *4*(10), 193-199. http://dx.doi.org/10.11114/jets.v4i10.1767

Palmeira, E. G. Q., Saint Martin, V. B., Gonçalves, V. B., Moraes, Í. A., Júnior, E. A. L., & Cardoso, A. (2020). The use of immersive virtual reality for vocabulary acquisition: A systematic literature review. *Anais do XXXI Simpósio Brasileiro de Informática na Educação*, 532-541. doi: 10.5753/cbie.sbie.2020.532

Pantelidis, V. S. (2009). Reasons to use virtual reality in education and training courses and a model to determine when to use virtual reality. *Themes in Science and Technology Education. 2*(SI). 59-70.

Park, M. (2018). Innovative assessment of aviation English in a virtual world: Windows into cognitive and metacognitive strategies. *ReCALL, 30*(02), 196–213. https://doi.org/10.1017/S0958344017000362

Parmaxi, A. (2020). Virtual reality in language learning: A systematic review and implications for research and practice. *Interactive learning environments*, *31*(1), 172-184. https://doi.org/10.1080/10494820.2020.1765392

Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. *Journal of intellectual disability research*, *46*(5), 430-443. https://doi.org/10.1046/j.1365-2788.2002.00425.x

Pashler, H., McDaniel, M. Rohler, D., & Bjork. R., (2008). Learning styles: concepts and evidence. *Psychological Science in the Public Interest. 9*(3).

Patra, I., Shanmugam, N., Ismail, S. M., & Mandal, G. (2022). An Investigation of EFL Learners' Vocabulary Retention and Recall in a Technology-Based Instructional Environment: Focusing on Digital Games. *Education Research International*, *2022*. https://doi.org/10.1155/2022/7435477

Peixoto, B., Pinto, D., Krassmann, A., Melo, M., Cabral, L., & Bessa, M. (2019). Using virtual reality tools for teaching foreign languages. *New Knowledge in Information Systems and Technologies. 932.* 581-588. https://doi.org/10.1007/978-3-030-16187-3_56

Pinto, R. D., Peixoto, B., Melo, M., Cabral, L., & Bessa, M. (2021). Foreign language learning gamification using virtual reality—a systematic review of empirical research. *Education Sciences*, *11*(5), 222. https://doi.org/10.3390/educsci11050222

Rospigliosi, P. A. (2022). Metaverse or Simulacra? Roblox, Minecraft, Meta and the turn to virtual reality for education, socialisation and work. *Interactive Learning Environments, 30*(1), 1-3. https://doi.org/10.1080/10494820.2022.2022899

Raja, R., & Nagasubramani, P. C. (2018). Impact of modern technology in education. *Journal of Applied and Advanced Research, 3*(S1), https://doi.org/10.21839/JAAR.2018.V3IS1.165

Read, J. (2004). 7. Research in teaching vocabulary. *Annual Review of Applied Linguistics, 24.* https://doi.org/10.1017/s0267190504000078

Reitz, L., Sohny, A., & Lochmann, G. (2019). VR-based gamification of communication training and oral examination in a second language. *International Journal of Game-Based Learning. 6*(2). 811-828. http://dx.doi.org/10.4018/IJGBL.2016040104

Sakkir, G., Dollah, S., & Ahmad, J. (2020). Students' perceptions toward using YouTube in EFL classrooms. *Journal of Applied Science, Engineering, Technology, and Education, 2*(1), 1-10. https://doi.org/10.35877/454RI.asci2125

Salem, A. A. M. S. (2017). Engaging ESP students with brain-based learning for improved listening skills, vocabulary retention and motivation. *English language teaching, 10*(12), 182-195. http://doi.org/10.5539/elt.v10n12p182

Sagar, B., & McNeill, Z., (2018, June 24). *How many words do you need to speak a language?* BBC. https://www.bbc.com/news/world-44569277

Schmidt, S. R. (2008). Distinctiveness and memory: a theoretical and empirical review. *Learning and Memory: A Comprehensive Reference. 2*(09) 125–144. https://doi.org/10.1016/B978-012370509-9.00143-1

Schmitt, N. (1997). Vocabulary learning strategies. *KUPDF*. 1-20. https://kupdf.net/download/schmitt-n-1997-vocabulary-learning-strategies-in-schmitt-n-and-mccarthy-m-eds-vocabulary-description-acquisition-and-pedagogy-cambridge-university-press-1_5afa6c69e2b6f5b941210a27_pdf#modals

Shabaneh, Y., & Farrah, M., (2019). The effect of games on vocabulary retention. *Indonesian Journal of Learning and Instruction, 2*(1), 79-90. https://doi.org/10.25134/ijli.v2i01.1687

Shih, Y. C., & Yang, M. T. (2008). A collaborative virtual environment for situated language learning using VEC3D. *Journal of Educational Technology & Society*, *11*(1), 56-68.

Smith, S. J. & Farra, S., Deborah, L,. Hodgson, E., Nicely, S., & Matcham, W., (2016). Learning and retention using virtual reality in a decontamination simulation. *Nursing Education Perspectives. 37*(4). 210-214 doi: 10.1097/01.NEP.0000000000000035

Snauwaert, F., (2021, March 8). *How many words do you need to speak English?* Click & Speak. https://clickandspeak.com/blog/en/4/how-many-words-to-speak-english/

Sokmen, A. J. (1997). Current trends in teaching second language vocabulary. *Vocabulary; description, acquisition and pedagogy*, 152-160.

Stars & Strikes. (2020). Different types of virtual reality. Retrieved October 01, 2022 from https://www.starsandstrikes.com/blog/different-types-of-virtual-reality/

Susanto, H. (2021). A study on students'difficulties in learning vocabulary. *Journey: Journal of English Language and Pedagogy*, *4*(2), 46-50. https://doi.org/10.33503/journey.v4i2.1413

Taft, M. (2003). Morphological representation as a correlation between form and meaning. *Springer.. 22.* 113-137. https://doi.org/10.1007/978-1-4757-3720-2_6

Taherdoost, H. (2016). Sampling methods in research methodology; how to choose a sampling technique for research. *SSRN Electronic Journal. 5*(2). 18-27. https://dx.doi.org/10.2139/ssrn.3205035

Taheri, M. (2014). The effect of using language games on vocabulary retention of Iranian elementary EFL learners. *Journal of Language Teaching and Research*, *5*(3), 544. doi:10.4304/jltr.5.3.544-549

Talebi, M., & Marzban, A. (2015). The effect of teaching critical reading strategies on advanced Iranian EFL Learners' vocabulary retention. *Theory and Practice in Language Studies*, *5*(3), 572. http://dx.doi.org/10.17507/tpls.0503.17

Tai, T.-Y., Chen, H. H.-J., & Todd, G. (2020). The impact of a virtual reality app on adolescent EFL learners' vocabulary learning. *Computer Assisted Language Learning*, 1–26. https://doi.org/10.1080/09588221.2020.1752735

The Franklin Institute. (2022). History of virtual reality. Retrieved October 01, 2022, from https://www.fi.edu/virtual-reality/history-of-virtual-reality

Trazo, S. P., & Abocejo, F. T. (2019). International phonetic alphabet (IPA) front vowel sound recognition of beginner foreign learners. *European Journal of Education Studies*. *5*(12). 183-196. http://dx.doi.org/10.5281/zenodo.2606194

Usluel, Y. K., & Mazman, S. G. (2009). Adoption of Web 2.0 tools in distance education. *Procedia-Social and Behavioral Sciences*, *1*(1), 818-823. https://doi.org/10.1016/j.sbspro.2009.01.146

Vazquez, C., Xia, L., Aikawa, T., & Maes, P. (2018). *Words in Motion: Kinesthetic Language Learning in Virtual Reality. 2018 IEEE 18th International Conference on Advanced Learning Technologies (ICALT).* http://doi.ieeecomputersociety.org/10.1109/ICALT.2018.00069

Walia, D. N. (2012). Traditional teaching methods vs. CLT: A study. *Frontiers of language and teaching*, *3*(1), 125-131.

Wigmore, I. (2016). Immersive virtual reality (immersive VR). Retrieved October 01, 2022 from https://www.techtarget.com/whatis/definition/immersive-virtual-reality-immersive-VR

Yang, W. & Dai, W. (2011). Rote memorization of vocabulary and vocabulary development. *English Language Teaching. 4*(4). 61-64. http://dx.doi.org/10.5539/elt.v4n4p61

Zheng, J. M., Chan, K. W., & Gibson, I. (1998). Virtual reality. *IEEE Potentials, 17*(2), 20–23. https://doi.org/10.1109/45.666641

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