Examination Article

A Systematic Review of Virtual Reality Studies in Foreign Language Teaching

Yabancı Dil Öğretiminde Sanal Gerçeklik Çalışmalarının Sistematik İncelemesi

Veysel KARSLI [1]

[1] Research Assistant. Ataturk University, Institute of Educational Sciences, Erzurum, Turkey

ABSTRACT

Developments in teaching technologies in recent years have made it possible to use virtual reality in foreign language teaching processes. However, the lack of technical knowledge and the lack of awareness of the potential of virtual reality and its usability in language teaching have caused virtual reality not to be used widely. For this reason, in this study, studies in this field were systematically examined in order to show the usability and effect of virtual reality technology for the improvement of foreign language teaching processes. In this context, relevant searches were made in three large databases and 46 studies were included in the scope of the study. These studies were examined in detail by the content analysis method in terms of the research methods, data collection tools, language domains targeted, sample levels, and sample sizes and the results were reported. The results obtained show that research methods, data collection tools, language domains targeted, sample levels, and sample sizes vary according to the purpose and scope of the study. Finally, based on the results obtained in the study, some suggestions were made for future studies.

Keywords: Virtual Reality, Foreign Language Teaching, Virtual Learning Environments

ÖZET

Son yıllarda öğretim teknolojilerinde yaşanan gelişmeler, yabancı dil öğretim süreçlerinde sanal gerçekliğin kullanımını mümkün kılmıştır. Ancak teknik bilgi eksikliği ve sanal gerçekliğin potansiyelinin ve dil öğretiminde kullanılabilirliğinin farkında olunmaması sanal gerçekliğin yaygın olarak kullanılmamasına neden olmuştur. Bu nedenle bu çalışmada sanal gerçeklik teknolojisinin yabancı dil öğretim süreçlerinin iyileştirilmesine yönelik kullanılabilirliğini ve etkisini gösterebilmek için bu alandaki çalışmalar sistematik olarak incelenmiştir. Bu kapsamda üç büyük veri tabanında ilgili taramalar yapılmış ve 46 çalışma araştırma kapsamına alınmıştır. Bu çalışmalar içerik analizi yöntemi ile araştırma yöntemleri, veri toplama araçları, hedeflenen dil alanları, örneklem düzeyleri ve örneklem büyüklükleri açısından detaylı bir şekilde incelenmiş ve sonuçlar rapor edilmiştir. Elde edilen sonuçlar, araştırma yöntemlerinin, veri toplama araçlarının, hedeflenen dil alanlarının, örneklem düzeylerinin ve örneklem büyüklüklerinin çalışmanın amacına ve kapsamına göre farklılık gösterdiğini göstermektedir. Son olarak çalışmada elde edilen sonuçlara dayalı olarak gelecekte yapılacak araştırmalar için bazı önerilerde bulunulmuştur.

Anahtar Kelimeler: Sanal Gerçeklik, Yabancı Dil Öğretimi, Sanal Öğrenme Ortamları

1. INTRODUCTION

With the developments in technology, the use and integration of technology in the language classroom environment have increased. This has made it possible to use innovative and emerging technologies such as virtual reality (VR) in the field of education (Parmaxi, et al., 2017; Loup, et al., 2016). VR can be defined as an extremely immersive experience that a person can enjoy and simulate something real (Lorenzo et al. 2019; Papanastasiou et al. 2018; Wei et al. 2015). VR is a technology that offers impossible experiences in educational environments with many endless opportunities. Moreover, VR is considered one of the most effective learning aid of today's world (Rogers, 2019). In this context, it is stressed that VR could have a great impact on the development of cognitive, psychomotor and affective skills (Jensen & Konradsen, 2018) as users can experience a very immersive and engaging learning environment thanks to VR (Makransky & Lilleholt, 2018). In support of this, Chavez and Bayona (2018), Krokos et al. (2019), Radianti et al. (2020) also observed in their studies that VR has the potential to provide permanent learning as it allows students to experience what they have learned in a real-life environment. These environments also allow students to interact directly with their environment and experience learning on their own (Lin & Lan, 2015; Christoforou et al., 2019). Moreover, VR has been connected to the development of positive attitudes such as motivation, collaboration, and engagement (Avgousti, 2018; Liu et al., 2018; Makransky & Lilleholt, 2018; Munezane, 2019; Snelson & Hsu, 2019). Therefore, it can be said that it has highly positive effects on learning outcomes (Gargrish, et al., 2020). In this context, it is argued that incorporating technology, namely VR, into language teaching and learning will improve the quality of the learning and the teaching process (Wang, et al., 2021). Considering all these benefits, it is thought that the use of VR in language learning processes will allow learning content that cannot be experienced in traditional teaching environments (Freina & Ott, 2015). However, even though VR is quite effective, teachers or researchers still hesitate to use this technology in the teaching environment as they are not aware of its potential and power in the learning process (Parmaxi, et al.,

2017). At this point, it is necessary to inform language teachers and researchers about the effectiveness of VR in developing language skills, the availability of VR applications that can be used for language learning, and the usability of these applications in foreign language teaching processes. In this context, this study examined the articles published in this field and provided empirical data and examined the anatomical structure of these articles to demonstrate the status, potential, effectiveness, and use of VR in foreign language teaching. The articles were analyzed in terms of their research methods, data collection tools, language domains targeted, sample levels, and sample sizes. For this purpose, the study tried to answer the following questions:

✓ What is the distribution of the studies by years of publication?
✓ What are the most frequently used research methods in the studies?
✓ What are the sample levels and sizes in the studies?
✓ What are the most frequently targeted language domains in the studies?
✓ What are the most frequently used data collection tools in the studies?
✓ What are the VR applications used in the studies?
✓ What are the roles of the samples and the researchers?
✓ What are the foreign languages aimed to be developed in the studies?

2. METHOD

In this study, content analysis was used. Content analysis is described as the detailed analysis of various types of documents (e.g. articles, journals.) for a specific purpose (McMillan & Schumacher 2010; Fraenkel et al., 2012). In this context, in this study, content analysis was used to analyze the studies in terms of their research methods, data collection tools, language domains targeted, sample levels, and sample sizes from a linguistic perspective.

2.1. Scope of the Study

Within the scope of the purpose of the study, Scopus, Web of Knowledge, and Eric databases were searched to identify studies to be included in the study. Searches were made using the keywords "virtual reality" and "foreign language" together. As a result of the searches made, the abstract, introduction, and methodology sections of the articles were examined and the studies suitable for the scope of the study were determined. Finally, 46 studies suitable for the purpose and scope of the study were included in this study.

2.2. Data Collection and Data Analysis

Content analysis was used to analyze the studies determined within the scope and purpose of the study. Before starting the analysis process, an "article analysis form" was developed by the researcher in accordance with the purpose and scope of the study. In this context, the publication year, research methods, data collection tools, language domains targeted, samples, and sample sizes of the studies were included in the analysis form. Then, the validity of the form was ensured by consulting a field expert and the form was given its final shape. After the analysis was completed, the findings were presented by grouping them according to the research questions.

3. FINDINGS

3.1. Distribution of the Studies by Years of Publication

Table 1. Distribution of the Studies by Years of Publication

Publication Year	Number of Studies Published
2008	2
2013	2
2015	2
2016	1
2017	2
2018	2
2019	8
2020	10
2021	12
2022	5
Total	46

According to Table 1, it can be seen that empirical studies on the use of VR in language learning have started to be carried out since 2008. When the distribution of the studies is examined, it is understood that there is a shift in the number of studies by year, especially after 2018.

3.2. Research Methods Used in the Studies

Table 2. Research Methods Used in the Studies

Method	*f*	%
Quantitative	22	48
Qualitative	5	11
Mixed	19	41
Total	46	100

When Table 2 is examined, it can be seen that quantitative research methods were used in 48% of the studies, mixed research methods were used in 41% of the studies, and qualitative research methods were used in %11 of the studies.

3.3. Sample Levels and Sample Sizes in the Studies

Table 3. Sample Levels in the Studies

Sample Type	*f*	%
Primary School Students	5	10.6
Middle School Students	5	10.6
High School Students	6	12.8
Undergraduate Students	31	66

According to Table 3, most of the studies were conducted with undergraduate students (N=31). However, the number of studies conducted with high school students (N=6), primary school students (N=5), and middle school students (N=5) were limited in numbers. In addition, only one study used more than one sample level.

Table 4. Sample Sizes in the Studies

Sample Size	*f*	%
1-10	3	6.5
11-30	15	32.6
31-50	14	30.4
50-100	13	28.3
100+	1	2.2
Total	46	100

Table 4 shows that most of the studies were conducted with 11-30 (N=15), 31-50 (N=14), and 50-100 (N=13) people, respectively. On the other hand, it was seen that three studies were conducted with 1-10 people, and only one study was conducted with more than 100 people.

3.4. Language Domains Examined in the Studies

Table 5. Language Domains Examined in the Studies

Language Domain	*f*
Speaking/Pronunciation	15
Vocabulary	12
Reading/Comprehension	5
Writing	2
Culture Learning	8
Affective Variables (Motivation, attitude, anxiety)	17
Total	59

It can be seen in Table 5 that affective variables such as motivation, attitude, and anxiety (N=17) are the most examined language domains in the studies. In addition, speaking/pronunciation (N=15) and vocabulary (N=12) are the domains that were examined in most of the studies. However, writing (N=2) was the least examined language domain in the studies.

3.5. Data Collection Tools Used in the Studies

Table 6. Data Collection Tools Used in the Studies

Data Collection Tool	*f*
Interview	20
Questionnaire/Survey	34
Observation	5
Proficiency Exam	18
Video Recordings	7
Eye Tracking	1
TOTAL	85

Table 6 reveals that questionnaires/surveys were the most commonly used data collection (N=34). Moreover, interviews (N=20) and proficiency exams (N=18) were also used as data collection tools in most of the studies. However, eye tracking was used in only one study as a data collection tool.

3.6. VR Applications Used in the Studies

Table 7. VR Applications Used in the Studies

VR Application	f
360° video/image applications	11
Mondly	6
Google Expeditions	4
EduVenture® Vr	3
Google Tours Vr	2
Second Life	2
VEC3D	1
Google Earth Vr	1
CAVE	1
VirtUAM	1
NeuroVr2	1
VILLAGE	1
vTime	1
Kingspray Graffiti Simulator	1
iVr Kitchen	1
House of Languages	1
VRLE	1
Angels and Demigods	1
Altspace	1
GEFE	1
VRAPT	1
VocabGo	1
IVR	1

Table 7 shows that a total of 24 different VR applications were used in the studies. Among these applications, 360° video/image applications (N=11) were the most used VR applications in the studies. It can also be understood from the table that Mondly (N=6), Google Expeditions (N=4), and EduVenture® Vr (N=3) were the applications used commonly in the studies examined within the scope of this study.

3.7. Roles of the Samples and the Researchers in the Studies

Table 8. Roles of the Samples in the Studies

Role of the Sample	f
User	1
Opinion Giving	1
User & Opinion Giving	44

According to Table 8, it is seen that the roles of the participants in the studies were mainly both user and opinion giving (N=1). However, they took the role of only user (N=1) and only opinion giving (N=1) in one study.

Table 9. Roles of the Researchers in the Studies

Role of the Researchers	f
Guide	2
Guide & Executor	34
Developer & Guide & Executor	10

When Table 9 is examined, it can be understood that the researchers mainly took the role of guide and executor (N=34) in the studies. In addition, researchers played developer, guide, and executor roles at the same time in 10 studies. On the other hand, in two studies researchers took the role of only guide.

3.8. Foreign Languages Aimed to be Developed in the Studies

Table 10. Foreign Languages Aimed to be Developed in the Studies

Foreign Language	f
English	28
Chinese	5
German	3
French	2
Italian	2
Spanish	1
Japanese	1

Polish	*1*
Korean	*1*
Russian	*1*
Czech	*1*

It can be concluded from Table 10 that English (N=28) was the most common language aimed to be developed in the studies examined within the scope of the study. Chinese was the second common language (N=5) in the studies. However, Spanish, Japanese, Polish, Korean, Russian, and Czech were only aimed to be developed in one study each.

4. RESULTS AND DISCUSSION

This study aimed to examine and analyze the articles published in the field of VR and language teaching from a linguistic perspective. The research methods, data collection tools, language domains targeted, sample levels, and sample sizes in the studies were examined. The results of the study are limited to 46 published articles on VR and language teaching.

When the results are examined, it can be said that use of VR in language learning processes has an increasing trend since 2008, especially after 2018. This can be explained by the developments in technology in recent years and the active use of developing technologies in foreign language teaching processes (Shadiev, et al., 2017; Wang, et al., 2021).

According to the results, it was found that the most commonly used research method was quantitative research method. This may be because of the advantages provided by quantitative research methods such as providing more reliable data and comparison regarding the data obtained (Lin, 2015; Dewaele & Li, 2020). In addition, it was also identified that mixed research methods were also preferred in most of the studies as mixed research method allows he quantitative data to be supported with qualitative data to get a more reliable result (Gong et al., 2020).

It was observed in the results that the studies were mostly conducted with undergraduate students. This is thought to be because of the ease of accessibility of university students by academics (Toy & Tosunoğlu, 2007). Moreover, it is thought that undergraduate students have the necessary language and technology skills to conduct the studies more effectively (Johnson, 2015). On the other hand, when the sample sizes in the studies were examined, it was seen that the sample sizes in the studies were mostly between 1-10, 31-50 and 50-100. However, only one study was conducted with more than one hundred people. This may be due to the fact that virtual reality is difficult to implement in very large groups (Chong, et al., 2018; Alalwan, et al., 2020).

When the language domains examined in the studies were analysed, it was understood that the affective variables such as motivation, attitude and anxiety were the most commonly examined language domains. This can be explained by the significance of the affective variables on language learning processes. According to Krashen (1982), affective variables are one of the most significant factors affecting language learning and acquisition process of the learner. It was also seen that most of the studies were focusing on the effects of VR applications on different language domains such as language skills, culture learning or affective variables. In this context, speaking and vocabulary skills were most commonly examined in the studies. This may be related to the fact that vocabulary is considered to form the basis of all language skills (Tılfarlıoğlu & Bozgeyik, 2012; Paribakht & Webb, 2016), and speaking skill is considered the most significant language skill to be able to communicate (Rao, 2019). In addition, culture learning was also one of the language domains frequently studied in studies. This can be explained with the strong relationship between learning the culture of the target language and language learning as it is thought that having a cultural background of a language makes language learning a lot easier (Gaeini, et al., 2011; Soomro, et al., 2015).

According to the results, it was determined that the most commonly used data collection tool in the studies was questionnaire/survey. This can be explained by the fact that the questionnaires are quite suitable for social science research and data analysis is quite easy (Bihu, 2021). In addition, interviews were also used as a data collection tool in the studies as interviews provide the necessary qualitative data to support the quantitative data (Cobern & Adams, 2020).

When the VR applications used in the studies were examined, it was revealed that there were plenty of VR applications available to use in language learning processes. The results showed that researchers mostly used applications that provide 360° videos and images as materials. The reason for this is the ease of use and accessibility of 360 videos and images, and most importantly, it provides the user with the feeling of being in that environment and offers a learning experience close to reality (Rupp, et al., 2019). On the other hand, an application called Mondly was also one of the most used applications in the studies. It can be thought that this is related to the

ease of use of the application, the fact that it is free and offers various activities and content for learning many languages (Gokturk, 2017).

Another notable result of the study was that, the participants took the role of user and opinion giving in almost all of the studies. On the other hand, researchers or teachers mainly took the roles of both guide and executor. This can be explained by the researcher's desire to prevent errors and disruptions that may occur during the process, to control the process and to intervene where necessary (Fink, 2000; Murumaa-Mengel & Sibak, 2014).

Finally, the results of the study showed that English was the most common language that was aimed to be developed in the studies examined within the scope of this study. The main reason for this can be considered as the fact that English is accepted as an international language in almost all areas all over the world and is taught as a second language in almost all countries (Dewi, 2012; Tan, et al., 2020; Moulin & Campos, 2017).

5. CONCLUSION AND RECOMMENDATIONS

When the result of this study are evaluated, it can be seen that the effects of VR on foreign language learning processes have been examined in terms of various language domains. It has been determined that researchers used various research methods, data collection tools, language domains targeted, sample levels, and sample sizes depending on their purpose. In addition, depending on the scope and aim of their studies, researchers mainly took the role of both guide and executor at the same time. However, they gave the user and opinion giving roles to the participants of their studies. Moreover, the results also showed that VR can be used to teach and learn various languages. Therefore, language teachers, no matter which language they are teaching, should realize the potential of VR and consider using VR in their teaching environments.

The following suggestions are made regarding the results obtained in the study.

- ✓ Qualitative studies on the use of VR in language learning can be designed.
- ✓ Further research can be designed and conducted to investigate the possible effectiveness of VR on listening skill development.
- ✓ Applied research can be designed and participants can be given more active roles such as designer and developer.

REFERENCES

Alalwan, N., Cheng, L., Al-Samarraie, H., Yousef, R., Alzahrani, A. I., & Sarsam, S. M. (2020). Challenges and prospects of virtual reality and augmented reality utilization among primary school teachers: A developing country perspective. *Studies in Educational Evaluation*

Avgousti, M. I. (2018). Intercultural communicative competence and online exchanges: A systematic review. *Computer Assisted Language Learning*, *31*(8), 819-853.

Bihu, R. (2021). Questionnaire Survey Methodology in Educational and Social Science Studies.

Chavez, B., & Bayona S. (2018). Virtual Reality in the Learning Process. In Á Rocha, H. Adeli, L. Reis & S. Costanzo (Eds.), *Trends and Advances in Information Systems and Technologies*. WorldCIST'18 2018 (pp. 1345-1356). Springer.

Chong, H. T., Lim, C. K., & Tan, K. L. (2018, September). Challenges in virtual reality system: A review. In *AIP Conference Proceedings* (Vol. 2016, No. 1, p. 020037). AIP Publishing LLC.

Cobern, W. W., & Adams, B. A. (2020). When interviewing: how many is enough?. *International Journal of Assessment Tools in Education*, *7*(1), 73-79.

Christoforou, M., Xerou, E., & Papadima-Sophocleous, S. (2019). Integrating a virtual reality application to simulate situated learning experiences in a foreign language course. *CALL and complexity–short papers from EUROCALL*, 82-87.

Dewaele, J. M., & Li, C. (2020). Emotions in second language acquisition: A critical review and research agenda. *Foreign Language World*, *196*(1), 34-49.

Dewi, A. (2012). English as an international language: An overview. *JEE, Journal of English and Education*, *6*(2).

Fink, A. S. (2000, December). The role of the researcher in the qualitative research process. A potential barrier to archiving qualitative data. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research, 1*(2).

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). How to design and evaluate research in education.

Freina, L., & Ott, M. (2015). A literature review on immersive virtual reality in education: state of the art and perspectives. In I. Roceanu, F. Moldoveanu, S. Trausan-Matu, D. Barbieru, D. Beliga & A. Ionita (Eds.), *Proceedings of the 11th International Conference eLearning and Software for Education - Rethinking education by leveraging the eLearning pillar of the Digital Agenda for Europe* (p. 133-141). "Carol I" National Defence University.

Gaeini, M., & Basirizadeh, F. S. (2011). THE ROLE OF CULTURE IN LANGUAGE TEACHING. In *ICERI2011 Proceedings* (pp. 4092-4095). IATED.

Gargrish, S., Mantri, A., & Singh, G. (2020, February). Measuring Students' Motivation towards Virtual Reality Game-Like Learning Environments. In *2020 Indo–Taiwan 2nd International Conference on Computing, Analytics and Networks (Indo-Taiwan ICAN)* (pp. 164-169). IEEE.

Gong, Y. F., Gao, X. A., & Lyu, B. (2020). Teaching Chinese as a second or foreign language to non-Chinese learners in mainland China (2014–2018). *Language Teaching*, *53*(1), 44-62.

Gokturk, N. (2017). Mondly Learning Languages (Review). In M. O'Brien & J. Levis (Eds). *Proceedings of the 8th Pronunciation in Second Language Learning and Teaching Conference*, (p. 241-247)

Jensen, L., & Konradsen, F. (2018). A review of the use of virtual reality head-mounted displays in education and training. *Education and Information Technologies*, *23*(4), 1515-1529.

Johnson, L., Becker, S. A., Estrada, V., & Freeman, A. (2015). *NMC horizon report: 2015 library edition* (pp. 1-54). The New Media Consortium.

Krashen, S. D. (1982). *Child-Adult Differences in Second Language Acquisition. Series on Issues in Second Language Research*. Newbury House Publishers.

Krokos, E., Plaisant, C., & Varshney, A. (2019). Virtual memory palaces: immersion aids recall. *Virtual reality*, *23*(1), 1-15.

Lin, H. (2015). Computer-mediated communication (CMC) in L2 oral proficiency development: A meta-analysis. *ReCALL*, *27*(3), 261-287.

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.

Liu, Q., Gong, D., & Chen, M. (2018). Applying virtual reality to study the effects of environmental education on college students' ethics and environmental literacy. *EURASIA Journal of Mathematics, Science and Technology Education*, *14*(6), 2255-2263.

Lorenzo, G., Lledó, A., Arráez-Vera, G., & Lorenzo-Lledó, A. (2019). The application of immersive virtual reality for students with ASD: A review between 1990–2017. *Education and Information Technologies*, *24*(1), 127-151.

Loup, G., Serna, A., Iksal, S., & George, S. (2016, September). Immersion and persistence: Improving learners' engagement in authentic learning situations. In *European conference on technology enhanced learning* (pp. 410-415). Springer, Cham.

Makransky, G., & Lilleholt, L. (2018). A structural equation modeling investigation of the emotional value of immersive virtual reality in education. *Educational Technology Research and Development*, *66*(5), 1141-1164.

McMillan, J. H., & Schumacher, S. (2010). Research in Education: Evidence-Based Inquiry, MyEducationLab Series. *Pearson*.

Moulin, L., & Campos, C. (2017). English as an international language: A critical approach. *IOSR Journal of Research & Method in Education*, *7*(2), 30-41.

Munezane, Y. (2021). A new model of intercultural communicative competence: bridging language classrooms and intercultural communicative contexts. *Studies in Higher Education*, *46*(8), 1664-1681.

Murumaa-Mengel, M., & Siibak, A. (2014). Roles of a Researcher: Reflections after doing a Case-study with Youth on a Sensitive Topic. *Media Practice and Everyday Agency in Europe*, 249.

Papanastasiou, G., Drigas, A., Skianis, C., Lytras, M., & Papanastasiou, E. (2019). Virtual and augmented reality effects on K-12, higher and tertiary education students' twenty-first century skills. *Virtual Reality*, *23*(4), 425-436.

Paribakht, T. S., & Webb, S. (2016). The relationship between academic vocabulary coverage and scores on a standardized English proficiency test. *Journal of English for Academic Purposes*, *21*, 121-132.

Parmaxi, A., Stylianou, K., & Zaphiris, P. (2017, September). Leveraging virtual trips in Google expeditions to elevate students' social exploration. In *IFIP conference on human-computer interaction* (pp. 368-371). Springer, Cham.

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, *147*, 103778.

Rao, P. S. (2019). The importance of speaking skills in English classrooms. *Alford Council of International English & Literature Journal (ACIELJ)*, *2*(2), 6-18.

Rogers, S. (2019). Virtual reality: The learning aid of the 21st century. *Secondary Virtual reality: The learning aid of the 21st century*.

Rupp, M. A., Odette, K. L., Kozachuk, J., Michaelis, J. R., Smither, J. A., & McConnell, D. S. (2019). Investigating learning outcomes and subjective experiences in 360-degree videos. *Computers & Education*, *128*, 256-268.

Shadiev, R., & Yang, M. (2020). Review of studies on technology-enhanced language learning and teaching. *Sustainability*, *12*(2), 524.

Snelson, C., & Hsu, Y. C. (2020). Educational 360-degree videos in virtual reality: A scoping review of the emerging research. *TechTrends*, *64*(3), 404-412.

Soomro, S., Kazemian, B., & Mahar, I. (2015). The importance of culture in second and foreign language learning. *Dinamika Ilmu: Journal of Education*, *15*(1), 1-10.

Tan, K. H., Farashaiyan, A., Sahragard, R., & Faryabi, F. (2020). Implications of English as an International Language for Language Pedagogy. *International Journal of Higher Education*, *9*(1), 22-31.

Tılfarlıoğlu, F. F. Y., & Bozgeyik, Y. (2012). The relationship between vocabulary learning strategies and vocabulary proficiency of English language learners. *International Journal of Applied Linguistics and English Literature*, *1*(2), 91-101.

Toy, B. Y., & Tosunoğlu, N. G. (2007). Sosyal bilimler alanındaki araştırmalarda bilimsel araştırma süreci, istatistiksel teknikler ve yapılan hatalar. *Gazi Üniversitesi Ticaret ve Turizm Eğitim Fakültesi Dergisi*, (1), 1-20.

Wang, Z., Guo, Y., Wang, Y., Tu, Y. F., & Liu, C. (2021). Technological Solutions for Sustainable Development: Effects of a Visual Prompt Scaffolding-Based Virtual Reality Approach on EFL Learners' Reading Comprehension, Learning Attitude, Motivation, and Anxiety. *Sustainability*, *13*(24), 13977.

Wei, X., Weng, D., Liu, Y., & Wang, Y. (2015). Teaching based on augmented reality for a technical creative design course. *Computers & Education*, *81*, 221-234.