DİJİTAL TEKNOLOJİ TEMELLİ YABANCI DİL ÖĞRETİMİNİN KELİME ÖĞRENİMİ ÜZERİNE ETKİSİ: BİR META-ANALİZ ÇALIŞMASI

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ÖZ

Dijital teknoloji destekli yabancı dil kelime öğrenimi çevrimiçi ve çevrimdışı sözlükler, multimedya, sosyal medya, televizyon, bilgisayar, akıllı telefonlar, tabletler ve mobil cihazlar gibi yeni ve modern teknolojilerin kullanılmasıyla kelimelerin öğrenilmesi anlamına gelmektedir. Alanyazın incelendiğinde, dijital teknolojinin yabancı dil kelime öğreniminde etkisi olduğunu belirten çalışmalar olduğu gibi kelime öğreniminde etkisi olmadığını gösteren ortaya koyan çalışmalar da yer almaktadır. Bu nedenle, bu çalışmanın amacı dijital teknolojiye dayalı öğretimin yabancı dil kelime öğrenimi üzerindeki etkisini inceleyen Türkiye'de yapılan deneysel çalışmaların meta-analizini yaparak genel etki büyüklünü hesaplamak ve bu etki büyüklüğünün çeşitli değişkenler açısından anlamlı bir biçimde farklılaşma gösterip göstermediğini belirlemektir. Bu araştırmada meta analitik tarama yöntemikullanılmıştır. 2003-2018 yılları arasında dijital teknolojiye dayalı öğretimin yabancı dil kelime öğrenimi üzerindeki etkisini inceleyen kodlama ölçütlerine uygun 34 çalışma (41 karşılaştırma) belirlenmiştir. Yapılan meta analiz sonucunda, dijital teknolojiye dayalı öğretimin yabancı dil kelime öğrenimi üzerinde pozitif, geniş aralıkta bir etki büyüklüğüne sahip olduğu tespit edilmiştir. Bu etki büyüklüğünün çalışmanın türüne göre tezlerin lehine ve gruplama yöntemine göre rastgele atama lehine anlamlı farklılık gösterdiği; ancak çalışmanın kalitesine, öğretim kademesine, kullanılan teknoloji türüne ve uygulama süresine göre anlamlı fark göstermediği tespit edilmiştir.

Anahtar Kelimeler: kelime öğrenme, yabancı dil, dijital teknolojiler, etki büyüklüğü

THE IMPACT OF DIGITAL TECHNOLOGY-MEDIATED FOREIGN LANGUAGE INSTRUCTION ON VOCABULARY LEARNING: A META-ANALYTIC REVIEW

ABSTRACT

The digital technology-mediated foreign language vocabulary learning involves the use of technological tools such as online and offline dictionaries, multimedia, social media, television, computer, smart-phones, tablets, and similar others. Although many research findings in the existing literature have emphasized the effectiveness of these technological tools on foreign language vocabulary learning, some studies also have suggested that the use of these tools in vocabulary learning does not make a significant difference in student achievement. This meta-analytic research aimed to investigate the overall impact of digital technology-mediated instruction on learning foreign language vocabulary in the Turkish context by calculating the mean effects followed by some moderator analyses. Therefore, 34 experimental studies (41 comparisons), conducted between the years 2003-2018, were included in the study according to the pre-defined coding criteria. The findings revealed that incorporation of digital technologies in foreign language teaching has a positive large impact on students' vocabulary learning achievement. The effect sizes of two moderators, the study type and grouping methods, were significant, while the study quality, education level, type of technology, and treatment duration, were not significant moderators.

Keywords: vocabulary learning, foreign language, digital technologies, effect size

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1. INTRODUCTION

Vocabulary learning has been considered as a basic and significant part of foreign language learning for long years. Various researchers acknowledged that vocabulary learning is a fundamental component of foreign and second language competency (Bozavlı, 2017; Cellat, 2008; Harley, 1996; Nation, 2001; Read, 2000). Krashen (1989) indicated that a large part of the meaning in a language is largely eventuated by words and hence, lack of vocabulary is regarded as the biggest obstacle in using the target language in an efficient way. Therefore, vocabulary is an essential factor that attaches four basic skills such as listening, reading, speaking and writing with a view to mastering a language (Kayaoğlu, Akbaş ve Öztürk, 2011; Nam, 2010). As noted by Wilkins (1972), "without grammar very little can be conveyed, [but] without vocabulary nothing at all can be conveyed". Thus, learning vocabulary with effective and innovative methods plays a significant role in foreign language education (Cited in Mahdi, 2018, p. 136).

The status of vocabulary learning may largely be attributed to the language teaching approaches which vary depending on the time. Because there exists a close relation between vocabulary learning and foreign language learning methodologies (Ketabi & Shahraki, 2011). Considering the methodologies in language teaching, Celce-Murcia (2001) divided the major trends into nine approaches, such as, (1)Grammar-Translation, (2)Direct, (3)Reading, (4)Audiolingualism, (5)Oral-Situational, (6)Cognitive, (7)Affective-Humanistic, (8)Comprehension-Based, and (9)Communicative. The common roles of these approaches in vocabulary learning have based upon the fact that language learners are supposed to prepare lists of vocabulary and memorize them, and that vocabulary could be learned without any effort. Besides, it has been generally presumed that vocabulary can take care of itself and that there is no need for direct vocabulary instruction (Schmidt, 2000).

However, the perspective towards vocabulary learning has radically changed in the 21st century, and outpouring interests have been demonstrated in this field. So to speak, the mobility towards efficient methodologies for teaching and learning vocabulary have emerged; in addition, language experts and researchers have recommended numerous strategies and techniques with regard to vocabulary learning, signifying the efforts of the foreign language learners (Ketabi & Shahraki, 2011; Mizumoto & Takeuchi, 2009; Nation, 2001). In this direction, two major approaches regarding vocabulary teaching and learning have been put forward (Ketabi & Shahraki, 2011; Nation, 2001). The first approach is the incidental (implicit) learning that focuses on acquiring vocabulary through four basic skills such as listening, reading, speaking, or writing. It also refers to the fact that learners are supposed to encounter a certain word several times in different contexts in order to acquire it accurately. On the other hand, the second approach is the intentional (explicit) learning which constitutes deciding the words that learners must learn, presenting the new words as well as developing fluency. It also involves processes such as a demonstration, a picture or a real object (Gass, 1999). Namely, both directions are expected to increase the vocabulary knowledge that language learners need to have so as to ensure effective communication.

By the same token, vocabulary learning can emerge in two different environments, namely, technology-based and traditional environment (Mahdi, 2018). Technology-based environment points to the use of new and modern technologies for vocabulary learning such as online and offline dictionaries, multimedia, social media, television, computer, smart-phones, tablets, and mobile devices. Therefore, it may be wise to mention that fast-moving digital technology provides learners in the vocabulary learning area with limitless opportunities. Thanks to the innovative methods and materials that digital technology presents, vocabulary learning can be much more colorful, supportive and motivating for the learners during the learning process. Whereas, the traditional environment is to use the word cards, dictionaries, word lists etc. Hence, technology-based environments have superior characteristics compared to the conventional one, in that learners can associate the meanings of the words with the images, sounds; meanwhile, they are exposed to the pronunciation and the written form of words simultaneously.

1.2. Technology-Mediated Vocabulary Learning

Digital technology today has a remarkable position in diversifying the foreign language education system like any other fields. Numerous technological devices are being ubiquitously integrated into the teaching and learning process. The internet and computer technology as the main tools alongside many other digital technologies have facilitated foreign language learning via virtual learning environments making it unrestrictive to time and space barriers (Baturay, Yıldırım,& Daloğlu, 2007). Digital technology has been in use for a few decades in language education. However, with the maturation of technology new sophisticated tools able to connect to the internet are being introduced and utilized widely in foreign language education. For example, online and offline dictionaries, language learning websites, video games, language applications, weblogs, wikis, multimedia, social media, TV programs, chat rooms and tools like tablets, smart-phones and iPods are some amongst the many used by the language learners around the world (Golonka, Bowels, Frank, Richardson & Freynik, 2014; Richards, 2015).

These sources not only provide extra opportunities to the learners to practice language skills but also facilitate vocabulary enrichment in the target language. It is obvious that stronger vocabulary means stronger language skills and the effective use of the target language. Although it makes the main component of language proficiency, most of the focus has been on developing other aspects of a language. One of the underlying problems facing individuals in foreign language learning could be overemphasizing the importance of language skills and grammar ignoring that vocabulary builds the basis to meet those purposes. In other words, vocabulary is an integral part of language learning process and has a pivotal role in building on language proficiency than grammar does, "be it a mother tongue or the second/foreign language" (Kilickaya & Krajka, 2010, p. 81).

However, the integration of modern technology into language education has made vocabulary learning easy and motivating. Learners, for instance, can get instant translation and definitions for unknown vocabulary or expressions with plentiful examples through diverse technological tools. So doing, they become aware of divergent usages of a word in a matter of seconds or minutes and also get motivated to acquire new vocabulary in the process. In addition, accessing materials and applications related to foreign language learning over the internet through computers, smart-phones, tablets etc, has made language acquisition easier by reading, writing, watching, listening and even speaking with the other language learners or natives. Students, for instance, could better learn the foreign language vocabulary through animations, graphic materials, and games designed according to their age groups under the guidance of an adult. These and other sources will help both incidental and intentional vocabulary acquisition with lasting effects easing the developmental process of linguistic skills in return (Golonka et al., 2014; Richards, 2015). Richards (2015) maintains that such resources provide meaningful language learning opportunities for the students without restricting their learning to the in-class instruction.

A great number of experimental and non-experimental studies are conducted throughout the world to examine the effectiveness of diverse digital technologies in foreign language vocabulary learning and acquisition and its superiority to traditional approaches considering different age groups and grade levels from school to university (e.g. Yip & Kwan, 2006; Fageeh, 2013; Shoaei & Alavi, 2016; Nejati, Jahangiri, & Salehi, 2018). Turkish researchers also have been examining the impacts of digital technologies in foreign language vocabulary learning since years proving their effectiveness over conventional classroom instruction (e.g. Fidan, 2003; Eren, 2015; Güvendir & Gezgin, 2015; Kurt & Bensen, 2017; Özer & Koçoğlu, 2017). In contrast, there exist some contradictory findings, too, reporting that no significant difference exists between the instruction with or without technology in foreign language vocabulary learning (Tokaç, 2005; Erkuş, 2008; Basoz & Can, 2016). In order to deal with such contradictions in the existing research, a synthetic analysis is required to get a fuller picture of how effective digital technologies are in foreign language learning in this country.

Only one meta-analysis study was found that explored the effectiveness of computer technologies on foreign language teaching against the conventional approaches in Turkey. The findings revealed that such tools have a significant impact on overall foreign language learning yielding a total effect size of 1.4321 (Tomakin & Yeşilkurt, 2013). One more study was found on technology-assisted foreign language vocabulary learning on 16 studies of different countries in the world (Mahdi, 2018). This particular study examined the effectiveness of using mobile devices against the conventional style in vocabulary learning. The results indicated that the use of mobile phones had a superior role in effective vocabulary learning than did conventional techniques.

Despite the existence of numerous studies on foreign language vocabulary learning using technology, no meta-analytic research was found in this regard in Turkey. Therefore, this study aims to examine the effects of a variety of digital technologies used in foreign language vocabulary learning and acquisition synthesizing primary research findings in Turkish context through a meta-analysis research design to provide an awareness as regards the general role of digital technologies revealed in the existing studies conducted in around two decades, that is, within the years 2000-2018. As a matter of fact, these years saw evolutional changes in the advancement of digital technologies in human life influencing the functionality of different sectors in a positive way despite many shortcomings may also have existed in terms of availability and affordability. Nevertheless, the vitality of technological tools in the education paradigm cannot be ignored, especially in foreign language education. Therefore, it is worth to give a fuller picture of a well-researched area through research synthesis to determine and direct the focus of future research. Considering the discussion made above, the following question was asked in compliance with the purpose of the study at hand:

What is the impact of digital technology-mediated instruction on learning foreign language vocabulary in the Turkish context?

2. METHOD

2.1. Research Model

This research has employed a meta-analytical review method in order to combine the results of the independent experimental studies. The meta-analytical review is a quantitative methodology for strengthening the growth of published research to more scientifically and comprehensively synthesize bodies of research (Chalmers, Hedges & Cooper, 2002). Cooper (1998) has indicated five stages in the process of meta-analysis: (i) problem formulation, (ii) data collection, (iii) data assessment (inclusion and exclusion criteria, (iv) data analysis and interpretation, and (v) presentation of the findings. Considering the five stages, Card (2012) has outlined four sections of a meta-analytical review:

(i) Introduction provides a background in theory, methods, and prior findings as well as the aim of the studies, research questions, and hypotheses of the meta-analytic review.

(ii) Method explains the research process with enough detail including literature search procedures, inclusion and exclusion criteria of the studies, coding of study characteristics and effect sizes along with data analytic strategy.

(iii) Results refer to the accurate and clear report of the findings of the analyses. A much more conceptual or methodological organization of the results consists of descriptive information, central tendencies, and heterogeneity, moderator analyses, diagnostic analysis.

(iv) Discussion: includes four components such as the review of findings, explanations, and implications of the findings, limitations, and conclusions.

2.2. Literature Search Procedure

The current literature search has been conducted through the use of various databases as follows: Educational Resources Information Centre (ERIC), ULAKBIM, EBSCO, and YOK Thesis Archive, between September 2017 and December 2018. Final search has been carried out in January 2019. The research has applied the following key terms in both Turkish and English: "vocabulary learning", vocabulary acquisition", "vocabulary learning and technology", "digital technology and vocabulary learning", "digital technology-assisted vocabulary learning", "digital technology-assisted vocabulary teaching", "vocabulary development" and "learning vocabulary through technology". The related literature has been searched through examining the references of the collected studies. Access to the necessary data has been ensured by communicating with the authors of restricted access theses. In addition, the survey process has been carried out by two researchers, and the relevant studies have been selected by deciding on whether the studies found by the researchers are similar. As a result, the researchers had 267 studies regarding digital technology assisted vocabulary learning in Turkey.

2.3. Study Inclusion and Exclusion Criteria

Within the context of this study, the specified criteria determined for the inclusion of the studies in this meta-analysis study are as follows: *(i)* They must be carried out in Turkey between the years of 2003 and 2018, *(ii)* They must be articles, thesis (master or doctoral) or proceedings that employed experimental design, *(iii)* The studies must examine the effect of digital technology-assisted teaching on students' vocabulary learning, *(iv)* They must include the duration time of the experiments. *(v)* Each study must report the quantitative data required to calculate impact sizes (sample size (*N*), mean score (*x*), standard deviation (*sd*), t-test and *p*-value, *r*-value). *(vi)* They must employ parametric tests (*t*-test, *F*-test or ANOVA). A considerable number of studies were excluded from the current meta-analysis as many of them used non-parametric tests or different technologies were used in both experiment and control groups. Besides, some of the studies adopted qualitative data interpretation.

As illustrated in Figure 1, initially 267 studies were identified and examined for their potential suitability to the current study considering the criteria noted above. While sorting and listing the selected studies, 113 of them were found to be multiple copies or duplicate studies indexed in more than one database, resulting in their exclusion. Afterward, the remaining 154 studies were screened by title and abstracts. As a result, 94 studies were excluded because they reported the impact of digital technology on other aspects of foreign languages other than vocabulary. The full-text of the remaining 60 studies underwent to further eligibility screening and ended up with the exclusion of 26 studies because five of them used non-parametric tests, 13 only had experimental groups all utilizing technology, two of them reported descriptive findings by giving percentages only, three of them employed qualitative methods, and three of them had limited access with no contact details to the authors. By the end, 34studies were found to be eligible for inclusion to the study. Figure 1 depicts the flowchart of the exclusion and inclusion processes of the studies obtained as a result of the literature search procedure. The

flowchart was adapted from Moher, Liberati, Tetzlaff, and Alman (2009) who have granted full permission for reproduction.
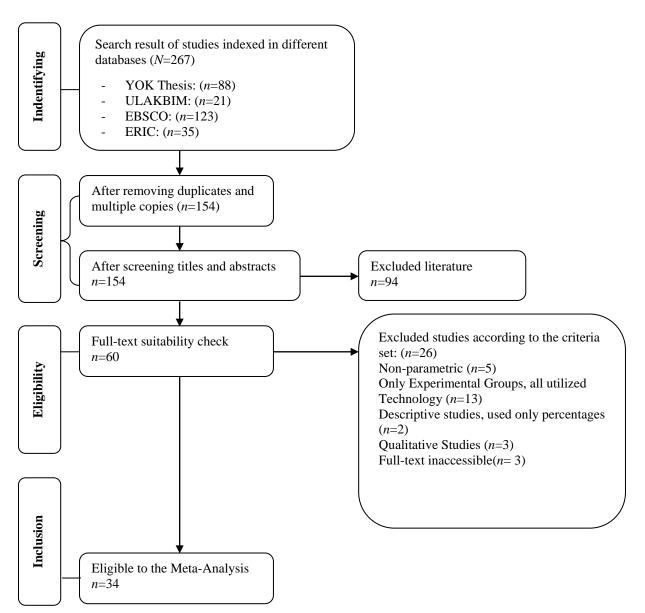


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Indentifying        Search result of studies indexed in different
                    databases (N=267)

                    -   YOK Thesis: (n=88)
                    -   ULAKBIM: (n=21)
                    -   EBSCO: (n=123)
                    -   ERIC: (n=35)


Screening           After removing duplicates and
                    multiple copies (n=154)


                    After screening titles and abstracts          Excluded literature
                    n=154                                         n=94


Eligibility         Full-text suitability check                   Excluded studies according to the criteria
                    n=60                                          set: (n=26)
                                                                  Non-parametric (n=5)
                                                                  Only Experimental Groups, all utilized
                                                                  Technology (n=13)
                                                                  Descriptive studies, used only percentages
                                                                  (n=2)
                                                                  Qualitative Studies (n=3)
                                                                  Full-text inaccessible(n= 3)


Inclusion           Eligible to the Meta-Analysis
                    n=34
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Figure 1The inclusion and exclusion process of the studies (see Moher et al, 2009)

2.4. Quality Appraisal of the Selected Studies

After identifying the eligible studies for the current study, they were further undertaken for quality check adopting a quality scoring system suggested by Pulye, Gagnon, Griffiths, and Johnson-Lafleur (2009). This quality appraisal system employs a dichotomous binary scoring technique by giving '1' to the study if a quality indicator is met and '0' if not met. However, in this study, a score of '0.5' was added for studies that partially met the pre-defined quality indicators. Then, the overall quality score percentage for each study was computed. First of all, the quality indicators were determined by setting three–item criterion that reflects the nature of the experimental studies as recommended by Pulye et al (2009, p. 550), that is:

1) The study reports the research implementation procedure, uses a random sampling technique for assigning the subjects to the treatment and control groups and controls the extraneous variable(s).
2) Conceals the subject allocation information of the groups (i.e. the presence of blinding technique).
3) The validity and reliability of the data are ensured and the number of subject withdrawal during the treatment is reported if there is any.

To compute the quality score percentage, the sum of the criteria score was divided by the total number of the criteria set (3 in this study) multiplied by 100. A study that received a quality score of 50% or more was considered of good quality whilst under that threshold ($< 50\%$) was considered low quality. However, none of the studies were excluded because of their low quality, but their effect sizes were compared to that of quality studies. The quality appraisal procedure was carried out independently by at least two researchers and the results were compared to ensure their validity and reliability. As a result, 12 studies scored lower than 50% falling into the low quality study category according to the three criteria given above.

2.5. Coding of Study Characteristics

The studies that met the inclusion and exclusion criteria were coded based on the author names, the publication year, the study type (master or doctoral theses and proceedings), the duration time of the experiment, and the education level. Besides, the sample size of the treatment and control group, their mean post-test scores (if there is not a significant difference between pre-tests of treatment and control groups) and SDs were coded.Lipsey and Wilson (2001, p.86) recommended to code 20 or more studies for a consistent reliability estimate between the coders. Therefore, 20 randomly selected studies were included in the meta-analysis and two coders were requested to fill the coding form in order to determine the reliability of the coding. For reasonable reliability, the agreement rate should be more than 80 percent (Miles & Huberman, 1994). The inter-coder reliability has been calculated as 100 percent through the use of formula as follows:

$$Agreement\,rate = \frac{Number\ of\ observations\ agreed\ upon}{Total\ number\ of\ observations}$$

2.6. Data Analytic Strategy

This meta-analytic review utilized Hedges g as an effect size index with a view to calculating the effect of digital technology-assisted teaching on vocabulary learning. Hedges g refers to the difference between the two groups mean in terms of general standard deviation and is more suitable for the sample lower than 20 (Cooper, 2010, pp. 163-168). Hedges' g was used in the present study since the sample size of some primary studies included in this meta-analysis was lower than 20. The effect sizes are classified and interpreted as: 0-0.20 = very small, 0.21-0.50 = small, 0.51-1 = medium, and >1.0 = large effect (Cohen, Manion, & Morrison, 2007, p. 521).
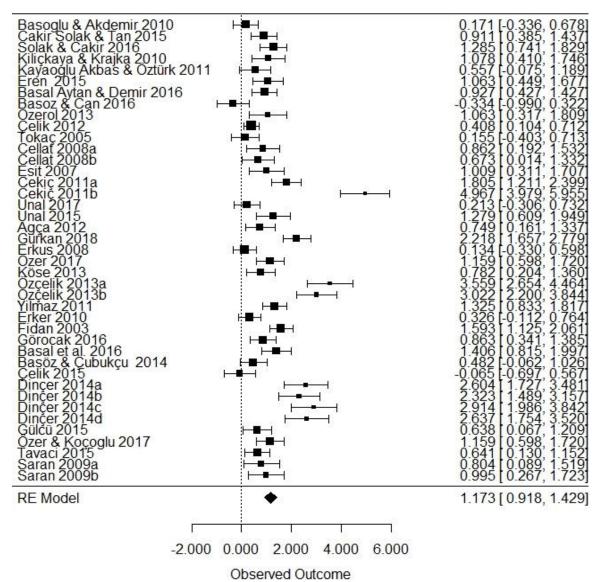
In the meta-analysis method, the effect size is calculated by combining these effect sizes according to the fixed or random effect models after calculating the effect sizes of each study. A test for heterogeneity is carried out in order to determine which model can be used to combine the effect sizes of the studies. In fact, the random effects model is recommended provided that the studies are obtained from the relevant literature (Borenstein et al., 2013, p.86). Thus, the general effect size has been identified according to the random effects model. Besides, a heterogeneity test has been used to determine the presence and magnitude of heterogeneity within studies. Heterogeneity tests examine as to whether the observed variance in effect sizes varies across the expected variance due to sampling error (Cooper, 2010, p. 185). Hence, this research has examined Q-value or the significance level of the heterogeneity test ($p< .05$). However, Q statistics do not refer to the level of heterogeneity of studies (Card, 2012, p.188). At that point, I^2 index is used. The I^2 index is interpreted as follows: up to 25% 'low', up to 50% 'medium' and up to 75% 'high' heterogeneity (Higgins, Thompson, Deeks and Altman, 2003).

This research has also performed categorical and regression moderator analysis for the purpose of identifying whether the common effect size of the digital technology-assisted teaching on vocabulary learning significantly varies across study types, study quality, education level, grouping methods (random or non-random assignment), technology types and treatment duration. Besides, a regression moderator analysis was carried out on treatment duration in the individual studies in order to explore if amount of exposure to technology-aided instruction makes any difference in students vocabulary learning.

Publication bias indicates the likelihood that a group of studies selected from published studies on a particular topic may not represent all studies (Rothstein, Sutton, & Borenstein, 2006). If the studies that are statistically significant are mostly examined in a meta-analysis, this analysis is likely to have publication bias (Borenstein et al., 2009). The funnel diagram, Duval and Tweedie's Trim and Fill and the Rosenthal's Fail-Safe N Test have been used to determine the publication bias of the studies and its effect on the obtained results. Meta-analysis has been conducted through the use of Office programs and CMA 2.0 trial version and R metafor (Viechtbauer, 2017).

3. FINDINGS

This meta-analytic study was conducted aiming to combine the sixteen years of experimental research findings in Turkey on the impact of digital technologies on foreign language vocabulary learning. After following the procedures required for the meta-analytic studies elaborated in the methods section, the first attempt was to compute the effect sizes. Since the primary studies were obtained from the existing literature, a random effect model was preferred (Borenstein et al., 2013). The Forest Plot given in Figure 2 illustrates the resultant effect sizes with accompanying statistics:

Basoglu & Akdemir 2010	0.171 [-0.336, 0.678]
Cakir Solak & Tan 2015	0.911 [0.385, 1.437]
Solak & Cakir 2016	1.285 [0.741, 1.829]
Kilickaya & Krajka 2010	1.078 [0.410, 1.746]
Kayaoglu Akbas & Öztürk 2011	0.557 [-0.075, 1.189]
Eren 2015	1.063 [0.449, 1.677]
Basal Aytan & Demir 2016	0.927 [0.427, 1.427]
Basoz & Can 2016	-0.334 [-0.990, 0.322]
Ozerol 2013	1.063 [0.317, 1.809]
Çelik 2012	0.408 [0.104, 0.712]
Tokaç 2005	0.155 [-0.403, 0.713]
Cellat 2008a	0.862 [0.192, 1.532]
Cellat 2008b	0.673 [0.014, 1.332]
Esit 2007	1.009 [0.311, 1.707]
Cekiç 2011a	1.805 [1.211, 2.399]
Cekiç 2011b	4.967 [3.979, 5.955]
Unal 2017	0.213 [-0.306, 0.732]
Unal 2015	1.279 [0.609, 1.949]
Agça 2012	0.749 [0.161, 1.337]
Gürkan 2018	2.218 [1.657, 2.779]
Erkus 2008	0.134 [-0.330, 0.598]
Ozer 2017	1.159 [0.598, 1.720]
Köse 2013	0.782 [0.204, 1.360]
Özçelik 2013a	3.559 [2.654, 4.464]
Özçelik 2013b	3.022 [2.200, 3.844]
Yilmaz 2011	1.325 [0.833, 1.817]
Erker 2010	0.326 [-0.112, 0.764]
Fidan 2003	1.593 [1.125, 2.061]
Görocak 2016	0.863 [0.341, 1.385]
Basal et al. 2016	1.406 [0.815, 1.997]
Basöz & Çubukçu 2014	0.482 [-0.062, 1.026]
Çelik 2015	-0.065 [-0.697, 0.567]
Dinçer 2014a	2.604 [1.727, 3.481]
Dinçer 2014b	2.323 [1.489, 3.157]
Dinçer 2014c	2.914 [1.986, 3.842]
Dinçer 2014d	2.637 [1.754, 3.520]
Gülcü 2015	0.638 [0.067, 1.209]
Özer & Koçoglu 2017	1.159 [0.598, 1.720]
Tavaci 2015	0.641 [0.130, 1.152]
Saran 2009a	0.804 [0.089, 1.519]
Saran 2009b	0.995 [0.267, 1.723]
RE Model	1.173 [0.918, 1.429]

Figure 2 Forest plot displaying the effect sizes and 95% confidence interval

As seen in Figure 2, the majority of the effect sizes ($n = 32$, 78.05%) are significant, while only a few of them are not ($n = 9$, 21.95%). Besides, more than half of the effect sizes were found large ($n = 20$, 48.78%), some medium ($n = 12$, 29.27%) while a few ($n = 9$, 21.95%) either small or very small across the individual studies and their subgroups. The proportional figures at the 95% CI level illuminate that most of the effect sizes are in favour of the treatment groups.

Also, combining a total of 41 effect sizes derived from 34 studies selected for this study yielded a common random effect size of $g = 1.173$ with 95% CI of 1.429 and 0.918. This result shows a strong effect according to the effect size classification criteria (Cohen et al., 2007, p. 521). Therefore, it can be concluded that the incorporation of digital technologies in foreign language teaching can have a positive impact on students' vocabulary learning achievement.

3.1. Heterogeneity Test and Moderator Analysis

A heterogeneity test was run in order to find out the level of heterogeneity of the effect sizes computed. Though, the distribution of the effect sizes and their heterogeneity across the existing research findings can also be seen in the Forest plot given in Figure 2.

Table 1.

Heterogeneity Test

Model	k	Hedge's g	Std. Error	95% CI		Heterogeneity			
				Lower Limit	Upper Limit	Q	df	p	I^2
Random Effect	41	1.173	0.130	0.917	1.428	308.378	40	0.000	87.029

As seen in Table 1, Q value equals to 308.378 with 40 degrees of freedom yielding a significant result ($p < 0.05$) in terms of the heterogeneity of the studies considered for the current study. Comparison of the Q statistics to the table of chi-square critical values with 40 degrees of freedom considering the 95% Confidence Intervals (CI) indicated that the Q is overlapping x^2 scores (Cooper, Hedges & Valentine, 2009, p. 593). Besides, the I^2 index was found to be 87.03% showing a high level of variability and differences amongst the effect sizes obtained from the primary research findings. This means that the real effect size may contrast from one study to another.

In order to trace the heterogeneity sources of the effect sizes noted above, several moderator analyses were conducted. Study type, study quality, education level, grouping method (random & non-random assignment), and the technology type used in the treatment group were considered as categorical moderators as portrayed in Table 2. However, the treatment duration in the studies was evaluated through a regression moderator analysis in order to discover if it is a meaningful predictor of increased vocabulary learning via digital technologies.
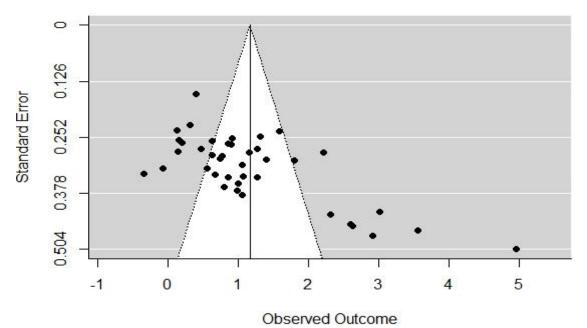
Table 2.

Moderator Analysis

Categorical Moderator	N	Effect Size	95% Confidence Intervals		$Z(p)$	Heterogeneity		
			Lower Limit	Upper Limit		Q_b	df	p
Study Type	**41**	**1.007**	**0.794**	**1.220**	**0.000**	**5.955**	**1**	**0.015**
Article	12	0.802	0.532	1.071	0.000			
Thesis	29	1.349	1.002	1.697	0.000			
Study Quality	**41**	**1.187**	**0.934**	**1.440**	**0.000**	**0.235**	**1**	**0.628**
High Quality	29	1.219	0.936	1.502	0.000			
Low Quality	12	1.063	0.500	1.626	0.000			
Education Level	**41**	**1.051**	**0.837**	**1.265**	**0.000**	**2.090**	**3**	**0.554**
Higher Education	28	1.157	0.860	1.455	0.000			
Pre-school	3	2.068	-0.486	4.623	0.113			
Primary	3	0.850	0.453	1.247	0.000			
Secondary	7	1.032	0.534	1.529	0.000			
Grouping Method	**41**	**0.912**	**0.727**	**1.097**	**0.000**	**9.716**	**1**	**0.002**
Random	16	0.756	0.547	0.965	0.000			
Not Random	25	1.467	1.072	1.861	0.000			
Type of Technology	**34**	**1.053**	**0.799**	**1.308**	**0.000**	**3.514**	**2**	**0.173**
Computer	16	0.998	0.578	1.418	0.000			
Internet	7	1.788	0.977	2.600	0.000			
Mobile	11	0.956	0.608	1.305	0.000			

As seen in Table 2, the calculated effect sizes of only two moderators, study type and grouping methods, were found meaningful ($Q_b > x^2$; $p < 0.05$ and $Q_b > x^2$; $p < 0.05$ respectively). Considering the sub-category of study types, the common effect size with reference to the theses was found larger ($g = 1.349$; 95% CI = 1.697 & 1.002) than that of the articles ($g = 0.802$; 95% CI = 1.071 & 0.532). Similarly, the non-random grouping effect size was found larger ($g = 1.467$; 95% CI = 1.861 & 1.072) than the random one ($g = 0.756$; 95% CI = 0.965 & 0.547). To sum up, the heterogeneity of the effect sizes is seemingly rooted in the study types (i.e. articles and theses) and the grouping methods (i.e. random & non-random assignment). However, the other moderators were found insignificant with medium to large effect sizes ($Q_b < x^2$; $p > 0.05$). Likewise, the results of the mixed-effects regression moderator analysis (given in Table 3) indicated that the duration of experiments in the primary studies is not a meaningful predictor of technology-assisted foreign language vocabulary learning achievement ($Q = 0.50$, $df = 1$, $p > 0,05$).

Table 3.

Regression moderator analysis for the 'Treatment Duration' in the primary studies

Method of Moments	Q	df	p
Model	0.49841	1	0.48020
Residual	57.20712	39	0.03005
Total	57.70553	40	0.03456

3.2. Publication Bias

Majority of the effect sizes reported in the previous sections were found large. However, in order to reveal whether they are representing real effect sizes or just produced because of the potential publication bias, several evaluations have been made despite the fact that majority of the effects sizes computed are related to the unpublished theses ($n = 22$, 70.73%) compared to the articles ($n = 12$, 29.27%). The 29 effect sizes computed for 22 theses were found larger ($g = 1.349$) than that of the articles ($g = 0.802$). This can reflect the validity of the computed effects sizes. However, when the funnel plot in Figure 3 was evaluated, the individual effect sizes were asymmetrically distributed around the mean effect size pointing that there is possible publication bias. Symmetric distribution is expected when the effect sizes are positioned in close proximity around the mean estimate to assume that the bias does not exist (Borenstein et al., 2009).

Figure 3 Funnel Plot Showing Asymmetric Distribution of Effect Sizes

However, further evaluations were made via Duval and Tweedie's Trim and Fill technique in order to reveal if the asymmetric effect size distribution displayed in the Funnel plot is true. As a result, it was found that the observed effect size ($g = 1.17295$; CI = 1.42845, 0.91746) is not comparatively different from that of adjusted one ($g = 1.41738$; CI = 1.13250, 1.70226). Both of these effect sizes show that these "results are robust to publication bias" since both of "the estimates are comparable" (Card, 2012, p. 274). Therefore, the asymmetry displayed in the Funnel plot could be falsified since it causes subjective interpretation according to Borenstein et al (2009). See Table 4 for more details.

Table 4.

Duval and Tweedie's Trim and Fill

Random effect model	Trimmed Studies	Hedge's g	Lower limit	Upper limit	Q value
Observed values		1.17295	0.91746	1.42845	308.37757
Adjusted values	7	1.41738	1.13250	1.70226	550.41677

In addition, Rosenthal's Fail-Safe N test was run in order to ensure that the common effect size is true and not resulted from the publication bias. The results indicated that 5465 studies with the common effect of zero are required to nullify the resultant common effect size in this study. This can also prove that the computed effect sizes are unbiased by supporting the findings above. According to Borenstein et al (2009), it will be a matter of

concern if "only a few studies (say, five or ten)" cause effect size nullification (p. 284). However, if a big number of studies were missing to invalidate the effect, it will be of little concern.

4. DISCUSSION AND CONCLUSION

This research combined the results of 34 experimental studies which were carried out in Turkey during 2002-2018 academic years and which explored the impact of digital technology-mediated foreign language instruction on vocabulary learning through a meta-analytical review method. The common effect size was identified as 1.173 depending on random effects model, meaning that the integration of digital technologies in foreign language teaching may have a profound positive impact (g = 1.173) on students' vocabulary learning achievement. Likewise, Abraham (2008) presented findings from a meta-analysis of 11 studies of computer-mediated glosses in second language reading comprehension and vocabulary learning. Accordingly, he found that computer-mediated glosses had a large effect on incidental vocabulary learning. This result is consistent with that of the current study. However, in the study conducted by Mahdi (2017), the findings of the meta-analysis indicated a medium impact of using mobile devices on vocabulary learning (g =.67).

As indicated by Baytak, Tarman, and Ayas (2011) learners' learning is improved by incorporating technology into the classroom. Numerous individual studies were conducted on the effectiveness of diverse digital technologies in foreign language vocabulary learning and acquisition and its superiority to traditional approaches in Turkey and abroad (Yip & Kwan, 2006; Nejati, Jahangiri, & Salehi, 2018; Fidan, 2003; Eren, 2015; Güvendir & Gezgin, 2015; Özer & Koçoğlu, 2017). In contrast, there existed some contradictory findings, indicating that no significant difference was noted between the instruction with or without technology in foreign language vocabulary learning (Tokaç, 2005; Erkuş, 2008; Basöz & Can, 2016).

The present study also analyzed whether the impact digital technology-mediated foreign language instruction on vocabulary learning differed across study type (thesis-article). As a result of the categorical moderator analysis, the calculated effect size of the moderator was found to be significant ($p < .05$). Considering the sub-category of study types, the common effect size with reference to the theses was found larger than that of the articles. The articles generated an effect size of ($g = 0.802$), whereas, theses produced the effect size of ($g = 1.349$), concluding that there is no publication bias in the resultant effect sizes. Li (2010) noted that published studies did not show a larger effect than Ph.D. dissertations. By the same token, the mean effect size for dissertations was found larger compared to the published articles. In contrast, different result has emerged in the study conducted by Kanadlı, Ünal & Karakuş (2015). Card, Stucky, Sawalani, and Little (2008) noted that published studies (articles) are more likely to have a significant effect than unpublished studies (theses). Therefore, it is recommended to include both published and unpublished studies in order to prevent publication bias and to carry out diagnostic analyzes to determine if publication bias is present in meta-analysis studies. Thus, this study performed Duval and Tweedie trimming and filling statistics and Rosenthal's Fail-Safe N, suggesting that this study was free from any publication bias.

Another result of the present study showed that the impact of digital technology-mediated foreign language instruction on vocabulary learning did not vary across study quality. In other words, the study quality moderator was found insignificant with medium to large effect sizes. This paves the way for the fact that the studies with high and low quality are not an indicator that determines the effectiveness of digital technology-mediated foreign language teaching on vocabulary learning. Although the primary studies were categorized as low or high quality in terms of the methodology used, it does not mean that their results are invalid or the kind of technology used is not influencing students' learning. Both categories displayed large effect sizes.

Upon examining the impact of digital technology-mediated foreign language instruction on vocabulary learning, no significant difference has been noted across education level (Higher education, pre-school, primary, and secondary). In other words, digital technology-mediated foreign language instruction positively affects students' vocabulary learning process irrespective to education level. In addition, research findings pointed out that the impact of digital technology-mediated foreign language instruction on vocabulary learning does not demonstrate a significant difference in terms of technology type (computer, internet, mobile). This opens the gate for the fact that digital technology-mediated foreign language instruction is efficient in vocabulary learning process no matter what technology type is used. The common effect sizes computed for computer and internet were large (more than 0.80) and that of mobile was medium (between 0.50 and 0.80). The use of computer, internet, and mobiles may be said to provide extra opportunities to the learners in order to practice language skills and facilitate vocabulary enrichment in the target language (Richards, 2015).

This study also illustrated that the impact of digital technology-mediated foreign language instruction on vocabulary learning significantly varied across the grouping method (random, not random). The random grouping generated effect size of ($g = 0.756$), whereas, not random grouping produced the effect size of ($g = 1.467$). This result shows that the common effect size of studies with non-random grouping on vocabulary

learning is large, while that of the studies with random grouping is low, yet this difference was found to be insignificant as a result of the moderator analysis. The main difference between these two groupings is that a random assignment is valid in the true-experimental design, whereas non-random assignment in quasi-experimental design (Büyüköztürk et al., 2008, pp. 142–156). Thus, this difference can be welcomed since the present study mostly includes quasi-experimental studies.

Lastly, the results of the mixed-effects regression moderator analysis indicated that the duration of experiments in the primary studies is not a significant predictor of technology-assisted foreign language vocabulary learning achievement. Under normal circumstances, treatment duration is a significant variable in foreign language vocabulary learning due to its novelty effect. To illustrate, in Kao's study (2014), the treatment duration was found to be influential in vocabulary learning, accordingly, digital games were effective for the EFL learners who received the long treatment duration of education. This result is inconsistent with that of the present study.

Recommendations

This study revealed that in-class utilization of digital technology in foreign language instruction can substantially contribute to the students' vocabulary development in the target language. This may, in turn, give students an inspiration in how to use or select the technological resources independent of the classroom context. Therefore, to provide effective learning opportunities for the students, the language teachers are recommended to try a variety of technological resources in the class. It does not require a classroom fully equipped with high-tech materials. A simple smart-phone or computer will do. However, teachers might need some methodological training about educational technology and the know-how of locating and using cost-effective resources in an efficient way. There is a bulk of well-documented research evidence about the use of educational technology in the field of foreign language education and its effectiveness is proven. Therefore, further empirical and meta-analytical studies could be recommended regarding the use of digital technologies in other fields of education to see how they impact the teaching and learning process in different fields.

Limitations

This meta-analytical review was limited to the studies conducted in Turkey in 2002–2018, and those accessed through the electronic media. Hence, the studies conducted abroad and published out of the electronic media were not included in this study. Likewise, the review includes only individual studies having experimental research design by ignoring those designed with relational survey model. Taking these limitations into consideration while conducting meta-analytical studies, it is expected to make a great contribution to the relevant literature.

REFERENCES
Studies asterisk marked are included in this meta-analysis.

Abraham, L. B. (2008). Computer-mediated glosses in second language reading comprehension and vocabulary learning: A meta-analysis. *Computer Assisted Language Learning, 21*(3), 199–226.

*Basoz, T. & Can, D. T. (2016). The effectiveness of computers on vocabulary learning among preschool children: A semiotic approach. *Cypriot Journal of Educational Sciences, 11*(1), 02-08.

Baturay, M. H., Yıldırım, İ. S. & Daloğlu, A. (2007). Web-Tabanlı İngilizce Kelime Öğretimi ve Tekrar Modeli. *Politeknik Dergisi*, *10*(3), 241-245.

Baytak, A., Tarman, B., & Ayas, C. (2011). Experiencing technology integration in education: children's perceptions. *International Electronic Journal of Elementary Education, 3*(2), 139-151. https://www.iejee.com/index.php/IEJEE/article/view/233. Date accessed: 17 June 2018.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Chichester, UK: John Wiley & Sons, Ltd.

Borenstein, M., Hedges, L.V., Higgins, J.P.T.& Rothstein, H.R. (2013). *Meta-analize giriş* (S.Dinçer, Çev.). Ankara: Anı.

Bozavlı, E. (2017). Vocabulary Teaching in Foreign Language via Audiovisual Method Technique of Listening and Following Writing Scripts. *International Education Studies, 10*(5), 129.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel F. (2009). *Bilimsel araştırma yöntemleri* [Scientific research method]. Ankara, Turkey: Pegem Akademi.

Card, N. A., Stucky, B. D., Sawalani, G. M., & Little, T. D. (2008). Direct and indirect aggression during childhood and adolescence: A meta-analytic review of gender differences, intercorrelations, and relations to maladjustment. *Child Development*, *79*, 1185–1229.

Card, N. A. (2012). *Applied meta-analysis for social science research*. New York, London: Guilford Press.

Celce-Murcia, M. (2001). Language Teaching Approaches: An Overview. In M. Celce- Murcia, (Ed), *Teaching English as a second or foreign language*, (pp.3-11). Boston, MA: Heinle & Heinle

*Cellat, S. (2008). *Computer Assisted Vocabulary Learning: A Study With Turkish 4th Grade EFL Learners* (Unpublished master's dissertation), Anadolu University, Eskişehir.

Chalmers, I., Hedges, L. V., & Cooper, H. (2002). A brief history of research synthesis. *Evaluation and the Health Professions*, *25*, 12-37. doi:10.1177/0163278702025001003

Cohen, L. Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed). New York: Routledge.

Cooper, H. (2010). *Research synthesis and meta-analysis: A Step by Step Approach* (4th ed.) Thousand Oaks: SAGE Publication.

Cooper, H. M. (1998). *Synthesizing research: A guide for literature reviews* (3rd ed.). Thousand Oaks, CA: Sage.

Cooper, H., Hedges, L. V. & Valentine, J. C. (2009). *The Handbook of Research Synthesis and Meta-Analysis* (2. Ed). New York: Russell Sage Foundation.

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

*Erkuş, E. (2008). *The Effects of Single-Player Computer Games on Vocabulary Learning* (Unpublished Master's Dissertation), Marmara University, Istanbul.

Fageeh, A. A. I. (2013). Effects of MALL Applications on Vocabulary Acquisition and Motivation. *Arab World English Journal, 4*(4), 420-447.

*Fidan, O. B. (2003). *The Effects of Using Different Strategies in Computerised and Non-Computerised Media on the Quantity of Learned Vocabulary, Time Spent to Learn and Retention of Learning* (Unpublished Master's Dissertation), Ankara University, Ankara.

Gass, S. (1999). *Discussion: Incidental Vocabulary Learning. SSLA, 21,* 319-333.

Golonka, E. M., Bowels, A. R., Frank, V. M., Richardson, D. L. & Freynik, S. (2014). Technologies for Foreign Language Learning: A Review of Technology Types and Their Effectiveness. Computer *Assisted Language Learning, 27,* 70-105. DOI:10.1080/09588221.2012.700315

Güvendir, E. & Gezgin, D. M. (2015) The Effect of a Facebook Game that Requires English Vocabulary Knowledge on Students' English Vocabulary Development. *Journal of Educational Sciences Research, 5,* 41-53. Doi:10.12973/jesr. 2015.51.3

Harley, B. (1996). Introduction: Vocabulary Learning and Teaching in a Second Language. The Canadian *Modern Language Review, 53*(1), 3-11.

Higgins, J. P. T, Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ, 6,* 557–560. Doi:10.1136/bmj.327.7414.557

Kanadlı, S., Ünal, K., & Karakuş, F. (2015). Kuantum Öğrenme Modelinin Akademik Başarıya Etkisi: Bir Meta-Analiz Çalışması/The Effect of Quantum Learning Model on Academic Achievement: A Meta-Analysis Study. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi, 12*(32).

Kao, C-W. (2014). The effects of digital game-based learning task in English as a foreign language contexts: A meta-analysis. *Education Journal, 42*(2), 113-141.

*Kayaoglu, M. N., & Akbas, D. (2011). A SmallScale Experimental Study: Using Animations to Learn Vocabulary. *Turkish Online Journal of Educational Technology-TOJET, 10*(2), 24-30.

Kilickaya, F. & Krajka, J. (2010). Teachers' Technology Use in Vocabulary Teaching. *Academic Exchange Quarterly.*

Ketabi, S., & Shahraki, S. H. (2011). Vocabulary in the Approaches to Language Teaching: From the Twentieth Century to the Twenty-First. *Journal of Language Teaching and Research, 2*(3), 726-731.

Krashen, S. (1989). We Acquire Vocabulary and Spelling by Reading: Additional Evidence for the Input Hypothesis. *The Modern Language Journal, 73*, 440-464.

Kurt, M. and Bensen, H. (2017). Six Seconds to Visualize the Word: Improving EFL Learners' Vocabulary through VVVs. *Journal of Computer Assisted Learning, 33*, 334-346. DOI: 10.1111/jcal.12182

Li, S. (2010). The effectiveness of corrective feedback in SLA: A meta-analysis. *Language learning. 60*(2), 309–365.

Mahdi, H. S. (2018). Effectiveness of Mobile Devices on Vocabulary Learning: A Meta-Analysis. *Journal of Educational Computing, 56,* 134-154. DOI: 10.1177/0735633117698826

Mizumoto, A. & Takeuchi, O. (2009). Examining the Effectiveness of Explicit Instruction of Vocabulary Learning Strategies with Japanese EFL University Students. *Language Teaching Research, 13*(4), 425 – 449.

Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med, 6*(7). doi:10.1371/ journal.pmed.1000097

Nam, J. (2010). Linking Research and Practice: Effective Strategies For Teaching Vocabulary In The ESL Classroom. *TESL Canada Journal/Revue TESL Du Canada, 1*(28),*33*127-135.

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

Nejati, E., Jahangiri, A. & Salehi, M. R. (2018). The Effect of Using Computer-Assisted Language Learning (CALL) On Iranian EFL Learners' Vocabulary Learning: An Experimental Study. *Cypriot Journal of Educational Science*. *13*(2), 351–362.

*Özer, Y. E. and Koçoğlu, Z. (2017). The Use of Quizlet Flashcard Software and its Effects on Vocabulary Learning. *Dil Dergisi [Language Journal], 161*(1),61-81.

Pulye, P., Gagnon, M.P., Griffith, F. and Johnson-Lafleur, J. (2009). A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. *International Journal of Nursing Studies, 46,* 529-546. Doi:10.1016/j.ijnurstu.2009.01.009

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

Richards, J. C. (2015). The Changing Face of Language Learning: Learning Beyond the Classroom. *RELC Journal, 46*(1).DOI: 10.1177/0033688214561621

Rothstein, H. R., Sutton, A. J., & Borenstein, M. (Eds.). (2006). *Publication bias in meta-analysis: Prevention, assessment and adjustments*. John Wiley & Sons.

Schmidt, N. (2000). *Vocabulary in Second Language Teaching*. Cambridge: Cambridge University Press.

Shoaei, F. and Alavi, M. (2016). The Impact of Computer-Assisted Language Learning Applications on Incidental Vocabulary Recall and Retention. *Bulletin de la Société Royale des Sciences de Liège, 85,* 1674-1686.

*Tokaç, A. (2005). *A Comparison of Computer-Assisted Vocabulary Instruction and Teacher-Led Vocabulary Instruction*. (Unpublished Master's Dissertation). Bilkent University, Ankara.

Tomakin, E. & Yeşilkurt, M. (2013). Meta-Analysis of Computer-Assisted Foreign Language Teaching Studies: A Sample of Turkey. *YYU Journal of Education Faculty, 10*(1), 248-263.

Viechtbauer, W. (2017). Metafor: Meta-Analysis package for R. R package version 2.0-0. Retrieved from: https://cran.r-project.org/web/packages/metafor/index.html

Yip, F. W. M., and Kwan, A. C. M. (2006). Online Vocabulary Games as a Tool for Teaching and Learning English Vocabulary. *Educational Media International, 43*, 233-249. DOI: 10.1080/09523980600641445

GENİŞ ÖZET

1. Giriş

Kelime öğrenimi, uzun yıllardır yabancı dil öğreniminin temel ve önemli bir parçası olarak kabul edilmiştir. Çeşitli araştırmacılar, kelime öğreniminin yabancı ve ikinci dil yeterliliğinin temel bir bileşeni olduğunu belirtmektedir (Bozavlı, 2017; Cellat, 2008; Harley, 1996; Nation, 2001; Read, 2000). Kelime öğrenme, teknoloji tabanlı ve geleneksel olmak üzere iki farklı ortamda ortaya çıkabilir (Mehdi, 2018). Teknoloji tabanlı ortam, çevrimiçi ve çevrimdışı sözlükler, multimedya, sosyal medya, televizyon, bilgisayar, akıllı telefonlar, tabletler ve mobil cihazlar gibi kelime öğrenme için yeni ve modern teknolojilerin kullanılmasına işaret eder. Bu nedenle, hızlı bir biçimde gelişen dijital teknolojinin, kelime öğrenen öğrencilere sınırsız imkânlar sağladığını söylemek mümkündür. Ayrıca, günümüzde dijital teknoloji, diğer alanlarda olduğu gibi yabancı dil eğitim sisteminin çeşitlendirilmesinde oldukça önemi bir role sahiptir.

Yabancı dilde kelime öğreniminde çeşitli dijital teknolojilerin etkiliğini ve eğitimin ilk yıllarından üniversiteye kadar farklı yaş grupları ve sınıf düzeylerini dikkate alarak geleneksel yaklaşımlara göre avantajlarını incelemek amacıyla Türkiye'de ve dünyada pek çok deneysel ve betimsel çalışmalar yapılmıştır (Yip & Kwan, 2006; Fageeh, 2013; Shoaei & Alavi, 2016; Nejati, Jahangiri, & Salehi, 2018; Fidan, 2003; Eren, 2015; Güvendir & Gezgin, 2015; Kurt & Bensen, 2017; Özer & Koçoğlu, 2017). Buna karşın, dijital teknoloji temelli öğretimin yabancı d,l kelime öğrenimi üzerinde herhangi bir etkisi olmadığını gösteren çalışmalar da mevcuttur (Tokaç, 2005; Erkuş, 2008; Basoz & Can, 2016). Mevcut çalışmalardaki bu farklılaşmaları göz önünde bulundurarak, dijital teknolojilerin Türkiye'de yabancı dil öğreniminde ne kadar etkili olduğuna dair genel bir yargıya varmak amacıyla sentetik bir analiz yapılması gerekmektedir. Ulusal alanyazın incelendiğinde, bilgisayar teknolojierinin yabancı dil kelime öğretimi üzerindeki etkisini inceleyen sadece bir tane meta-analiz çalışması olduğu görülmektedir (Tomakin & Yeşilkurt, 2013). Fakat, alanyazında dijital teknoloji temelli öğretimin kelime öğrenimi üzerindeki etkisini inceleyen deneysel çalışmaların meta-analiz çalışmasının olmadığı tespit edilmiştir. Bu nedenle, bu çalışmanın amacı dijital teknolojiye dayalı öğretimin yabancı dil kelime öğrenimi üzerindeki etkisini inceleyen Türkiye'de 2003-2018 yılları arasında yapılan deneysel çalışmaların meta-analizini yaparak genel etki büyüklünü hesaplamak ve bu etki büyüklüğünün çeşitli değişkenler açısından anlamlı bir biçimde farklılaşma gösterip göstermediğini belirlemektir.

2. Yöntem

Bu araştırma, deneysel çalışmaların sonuçlarını birleştirmek amacıyla meta-analitik tarama yöntemi kullanmıştır. Meta analitik tarama yöntemi belirli bir konuda yapılan bireysel çalışmaların sonuçlarını birleştirerek sentezlemeyi ve dolayısıyla bireysel çalışmaların sınırlılıklarını istatistiksel olarak azaltmayı hedefleyen bir yöntemdir (Büyüköztürk vd., 2009). Cooper (1998) meta-analiz sürecinin beş aşamadan oluştuğunu belirtmiştir: (i) problem formülasyonu, (ii) veri toplama, (iii) veri değerlendirmesi (dahil etme ve hariç tutma kriterleri), (iv) veri analizi ve yorumlama, ve (v) bulguların sunulması.

Mevcut literatür taraması Eylül 2017 - Aralık 2018 arasında aşağıdaki gibi çeşitli veritabanları kullanılarak gerçekleştirilmiştir: ERIC, ULAKBİM, EBSCO ve YOK Tez Arşivi. Son arama Ocak 2019'da yapılmıştır. Araştırmalar, hem Türkçe hem de İngilizce olarak çeşitli anahtar terimler kullanılarak taranmıştır: "kelime öğrenme", "kelime edinme "," kelime öğrenme ve teknoloji "," dijital teknoloji ve kelime öğrenme "," dijital teknoloji destekli kelime öğrenme "," dijital teknoloji temelli kelime öğretimi "," kelime gelişimi "ve" teknoloji ile kelime öğrenimi ". Araştırma süreci iki araştırmacı tarafından gerçekleştirilmiş ve araştırmacılar tarafından bulunan çalışmaların benzer olup olmadığına karar verilerek ilgili çalışmalar seçilmiştir. Sonuç olarak, araştırmacılar, Türkiye'de dijital teknoloji destekli kelime öğrenme konusunda 267 çalışmaya ulaşmışlardır. Ardından, çalışmaları dahil etme kriterleri belirlenmiş, ve bu doğrultuda çalışmalar elenerek 34 çalışma ile analiz sürecinde gidilmiştir.

Bu çalışmada her bir çalışmanın etki büyüklüğünün hesaplanmasında Hedge's g katsayısı kullanılmıştır. Her bir çalışmanın etki büyüklüğü hesaplandıktan sonra genel etkinin hangi modele (sabit ya da rastgele etkiler modeli) dâhil edilerek hesaplanacağını belirlemek için heterojenlik testi yapılmıştır. Hesaplanan genel etki büyüklüğünün çalışma türüne, öğretim kademesine, çalışmanın kalitesine, gruplama yöntemine ve kullanılan teknoloji türüne göre anlamlı bir farklılık gösterip göstermediğini belirlemek için kategorik moderatör analizi yapılmıştır. Bunun yanı sıra, bu etkinin uygulama süresine göre anlamlı bir biçimde farklılaşma gösterip göstermediğine regresyon moderatör analizi yapılmıştır. Yayın yanlılığının varlığını belirlemek ve analiz üzerindeki etkisini değerlendirmek amacıyla diagnostik analiz gerçekleştirilmiştir. Diagnostik analizde huni grafiği, Duval ve Tweedie'nin kırpma ve doldurma istatistiği, Rosenthal'ın Korumalı N testi kullanılmıştır.

3. Bulgular, Tartışma ve Sonuç

Bu araştırma, 2002-2018 eğitim-öğretim yılında Türkiye'de gerçekleştirilen ve dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimi üzerindeki etkisini bir meta-analitik inceleme yöntemi ile inceleyen 34 deneysel çalışmanın sonuçları birleştirilerek yürütülmüştür. Araştırma sonucunda, yaygın etki modeline bağlı olarak ortak etki büyüklüğü 1.173 olarak belirlenmiştir. Bu durum, dijital teknolojilerin yabancı dil öğretimine entegrasyonunun öğrencilerin kelime öğrenme başarısı üzerinde geniş çapta olumlu bir etkiye sahip olduğunu göstermektedir. Benzer şekilde, Abraham (2008) bilgisayar kullanımının kelime öğrenimi üzerinde büyük bir etkisi olduğunu ortaya koymuştur. Bu sonuç mevcut çalışmanın sonucuyla tutarlılık göstermektedir.

Araştırmada, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimi üzerindeki etkisinin çalışma türüne (tez-makale) göre anlamlı farklılık gösterip göstermediğini belirlenmiştir. Yapılan kategorik moderatör analizi sonucunda, hesaplanan etki büyüklüğünün çalışmanın türüne göre anlamlı bir biçimde farklılaştığı görülmektedir ($p < .05$). Çalışma türlerinin alt kategorisi göz önüne alındığında, bu farklılaşmanın tezlerin lehine olduğu tespit edilmiştir. Li (2010) tarafından yapılan çalışmada, makalelerin doktora tezlerinden daha büyük bir etki göstermediği sonucuna ulaşılmıştır. Bu sonuç mevcut çalışmanın sonuçlarıyla tutarlılık göstermektedir. Buna karşın, Kanadlı, Ünal & Karakuş (2015) yaptıkları çalışmada etki büyüklüğünün makale türündeki çalışmalar lehine olduğu belirlenmiştir.

Bu çalışmanın bir diğer sonucu, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimi üzerindeki etkisi çalışma kalitesine göre anlamlı bir biçimde farklılaşmamasıdır. Bu durum, yüksek ve düşük kalitede yapılan çalışmaların, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimindeki etkililiğini belirleyen bir gösterge olmadığı gerçeğini ortaya koymaktadır. Ayrıca, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimi üzerindeki etkisinin öğretim kademesi ve kullanılan teknoloji türüne göre de anlamlı farklılık göstermediği sonucuna ulaşılmıştır. Fakat, yapılan analizler sonucunda, dijital teknoloji temelli yabancı dil öğretiminin, öğretim kademesine bakılmaksızın öğrencilerin kelime öğrenme sürecini olumlu yönde etkilediği görülmektedir. Bunun yanında, etki büyüklüğü kullanılan teknoloji türüne göre anlamlı bir biçimde farklılık göstermese de, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenme sürecinde etkili olduğu ifade edilebilir. Bilgisayar ve internet için hesaplanan etki büyüklüklerinin geniş çapta (0.80'den fazla) ve mobilin orta düzeyde (0.50 ile 0.80 arasında) olduğu bu durumu kanıtlar niteliktedir. Bilgisayar, internet ve cep telefonlarının kullanılmasının, öğrencilerin dil becerilerini pekiştirmek ve hedef dilde kelime zenginliğini kolaylaştırmak için ek fırsatlar sağladığı söylenebilir (Richards, 2015).

Araştırma sonucunda, dijital teknoloji temelli yabancı dil öğretiminin kelime öğrenimi üzerindeki etkisinin gruplama yöntemine göre rastgele gruplama lehine olduğu sonucuna ulaşılmıştır. Son olarak, regresyon moderatör analizinin sonuçları, birincil çalışmalarda uygulama süresinin, teknoloji destekli yabancı dil kelime öğrenme başarısının önemli bir göstergesi olmadığını ortaya koymaktadır. Normal şartlar altında, uygulama süresi, inovasyon etkisinden dolayı yabancı dil kelime öğreniminde önemli bir değişkendir. Bu sonucun aksine, Kao (2014) çalışmasında kelime öğreniminde uygulama süresinin etkili olduğunu belirlemiştir.

Yapılan bu çalışma ile dijital teknolojinin sınıf içinde yabancı dil öğretiminde kullanılmasının, öğrencilerin hedef dilde kelime hazinelerinin gelişmesine önemli ölçüde katkıda bulunabileceği ortaya konmuştur. Dolayısıyla, öğrencilere etkili öğrenme fırsatları sağlamak için, yabancı dil öğretmenlerine sınıfta çeşitli teknolojik kaynakları kullanmaları önerilmektedir. Bununla birlikte, öğretmenlere eğitim teknolojisi ve düşük maliyetli kaynakları verimli bir şekilde bulma ve kullanma konusunda eğitimler verilmesi önerilmektedir.

ETİK BEYANNAME

Yapılan bu araştırmanın yazım sürecinde bilimsel ve etik kurallara tüm araştırmacılar tarafından uyulmuş, farklı eserlerden yararlanması durumunda atıfta bulunulmuş, kullanılan verilerde herhangi bir tahrifat yapılmamış, araştırmanın tamamı veya bir kısmı farklı bir akademik yayın platformunda yayınlatılmak üzere gönderilmemiştir. Tüm bu durumlardan araştırmada ismi bulunan yazarların bilgisi olduğunu ve gerekli kurallara uyulduğunu beyan ederim. 03.03/2020

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