



Are Digital Technologies Effective for the Improvement of L2 Vocabulary at Tertiary Level?

Ayşe Merzifonluoğlu

Erzincan Binali Yıldırım University

Aysegül Takkac Tulgar

Ataturk University

ABSTRACT

The popularity of technology use in various aspects of individuals' lives has necessitated integrating some form of technologies into language education to have a more effective teaching and learning process. Considering basic and sub-skills in English, vocabulary is probably the most preferred skill to learn by using different technological tools and applications. The present study, therefore, sought to investigate whether technology had an impact on L2 vocabulary development in a positive way by raising the awareness of learners in terms of using technology for educational purposes. A quasi-experimental research design was preferred. The data was obtained through creative writing assignments and an achievement test. 48 prep-class students took part in this study. The results revealed that although learners in the experimental group outperformed, the scores of creative writing assignments and achievement tests belonging to two groups were statistically non-significant. Setting out from these findings, some practical and pedagogical suggestions were provided.

INTRODUCTION

Like basic language skills, vocabulary development as a sub-skill is very challenging for learners in language education. While most learners are prone to memorizing L2 vocabulary in paper-based materials, some of them seek alternative ways to learn the target words by using visual, aural, and contextual elements (Nakata, 2008). At this point, technology has penetrated language education as a necessity (Godwin-Jones, 2011; Li, 2017) due to its advantages such as temporal and contextual flexibility, immediate feedback, collaboration, interaction, more opportunities to practice, authenticity and rich content in various forms (Akhmedov & Shuhkrat, 2020; Chartrand, 2012; Jarvis, 2015; Marek & Wu, 2019; Miangah & Nezarat, 2012; Taskiran et al., 2018).

Regarding the changing teaching and learning trends with the impact of technological advancements, it is not surprising that there is a growing number of studies conducted to examine the potential of technology in promoting learners' proficiency in English and vocabulary is seen as the most studied skill in the relevant literature (Celik, 2013; Elaish et al., 2019; Golonka et al., 2014; Montero et al., 2018; Motallebzadeh et al., 2011; Ozdemir & Aydin, 2015; Shadiev & Yang,

2020; Solak, 2014; Song & Fox, 2008; Stockwell, 2007; Tseng & Yeh, 2018; Yang et al., 2021; Zhang et al., 2011). However, when the related literature is examined, it is seen that there is a common interest in using SMS through mobile technologies for the improvement of vocabulary (Duman et al., 2015). Additionally, research shows that most of these studies generally use technology out of the classroom (Lin & Lin, 2019). As a result, it seems that less attention is given to vocabulary learning through technology both in and beyond the traditional learning setting, which provides opportunities to do individual and group activities. The current study, therefore, intends to explore whether technology has a positive effect on prep-class students' vocabulary development in and beyond the classroom by using any kind of technological tools with the Internet connection besides raising awareness in terms of using technology for educational purposes and their advantages in language learning process.

LITERATURE REVIEW

There has been a shift from conventional language learning to more technology integrated language learning as a natural consequence of technological advancements and more digitally literate learners (Berrett et al., 2012; Golonka et al., 2014; Takkac Tulgar, 2019; Yurdagul & Oz, 2018). Over time, various concepts such as technology enhanced learning, technology integrated learning, computer-assisted learning, mobile-assisted learning, mobile learning, distance learning, e-learning, web-based learning settings have come out as different forms of technology are preferred (Jarvis & Achilleos, 2013). No matter how many and how different terms are used to represent the presence of technology in language education, the main aim is to provide a rich context in and out of the classroom and develop learners' knowledge and skills. One of the language skills mostly studied in the relevant literature is vocabulary that has great importance in terms of constructing knowledge and facilitating communication among learners (Alfitri et al., 2021; Hadi, 2017; Viera, 2017) whilst it takes much time to improve and more effort to learn (Akdogan, 2017) compared to other skills. Especially for beginner learners, vocabulary retention may be a bit stressful and boring due to the need for extra practice (Snow & Kim, 2007; Wu & Huang, 2017). Therefore, learners seek ways to learn the target vocabulary in a more entertaining way according to their pace, which is possible through technological tools, websites, and applications both in formal and informal learning environments (Arvanitis, 2019). Likewise, teachers and instructors try to find alternative ways to integrate technology in different ways such as SMS, social networks, and applications according to the level of the learners and infrastructure of the settings to attract learners' attention and provide a more effective teaching process. The following paragraphs exemplify research in which the attempts of learners and instructors are presented with the aim of improving vocabulary skills.

Chen and Chung (2008) created a personal digital assistant (PDA)-based English vocabulary learning system to help participants develop at their own learning pace. The results showed that the method attracted learners' attention and improved their vocabulary output due to the versatile and efficient learning environment offered by PDAs at the end of the five-week process. Kennedy and Levy (2008) examined the impact of SMS that was scheduled by teachers and sent once a week to help Australian university students learn vocabulary. The findings showed that using technology to learn vocabulary made learning more enjoyable and words learnt through technology were easier to recall. Lu (2008) compared the performance and attitudes of 30 Taiwanese learners in traditional and SMS-based vocabulary learning over the course of two

weeks, concluding that learners in SMS-based lessons outperformed those in text-based content. The study also revealed that while there were some limitations due to technical problems, learners had positive attitudes toward mobile learning. Zhang et al. (2011) compared the effectiveness of vocabulary learning via text messages sent at regular intervals to the effectiveness of learning via printed handouts, which 78 Chinese university students divided into two groups studied at their own rate. The results revealed that although there was no statistically significant difference between the two groups in the delayed test used to evaluate retention rates, the SMS group had higher scores in shorter time. Printed flashcards and m-learning were compared in terms of vocabulary acquisition in English as a second language in Tehran for seven weeks by Azabdaftari and Mozaheb (2012). The results showed that students learning through their mobile phones outscored students learning through flashcards. Suwantarathip and Orawiatnakul (2015) utilized mobile-based practices to boost L2 vocabulary acquisition of 80 students at tertiary level and the results demonstrated that the experimental group learned the target vocabulary better and used them in a more active way. Bensalem (2018) investigated the effectiveness of WhatsApp on the academic vocabulary skills and attitudes towards mobile learning of 40 Arabian EFL students. The results indicated that the students using a mobile application to learn vocabulary were more successful and had more positive attitudes towards mobile learning than the students using paper-based materials. Poláková and Klímová (2019) investigated whether a vocabulary application through mobile devices could increase students' success and they found out that the students were able to remember more words compared to those in the conventional classroom setting. They also noted that using a digital tool enabled students to experience a more enjoyable and collaborative learning process.

Similar to the case in international contexts, vocabulary is the most commonly studied skill also in the national context. For instance, Cavus and Ibrahim (2009) developed a learning platform called MOLT available in wireless technologies and explored how it affected the language learning process. The results indicated that MOLT had the potential in promoting students' success in vocabulary skills. Basoglu and Akdemir (2010) used a flashcard application in mobile phones with the aim of developing L2 vocabulary in six weeks and the results of the post-test revealed that students favored more learning with flashcards through mobile phones than using printed flashcards. Kayaoglu et al. (2011) studied the effect of animation on 39 students' vocabulary performance for two semesters. Despite insignificant results between the two groups, students in the animation community had higher scores than students in the control group. Saran et al. (2012) used multimedia messages through mobile phones to improve L2 English learners' vocabulary skills in a 10-week study. The messages included descriptions of the target vocabulary, sample sentences, relevant visual materials, pronunciation of the words, and multiple-choice tests. The results showed that students who received content via multimedia messages improved their vocabulary knowledge more than those who received content via web pages and printed texts. Agca and Ozdemir (2013) investigated whether visual elements via 2D barcodes had a positive effect on vocabulary learning and the findings revealed that when vocabulary learning was supported with multimedia content, students' proficiency levels increased. Cakmak and Ercetin (2018) used multimedia glosses for text recall and incidental vocabulary learning through mobile-assisted L2 listening tasks that were implemented by using four different forms: text-based, visual-based, text- and visual-based glosses, and no glosses. The findings showed that glosses were supportive tools for vocabulary recall and production despite their ineffectiveness on text recall.

The international and national literature show that integration of technology for vocabulary learning mostly contributed to the improvement of vocabulary skills compared to the conventional

learning environments with paper-based materials (Lin & Lin, 2019; Mahdi, 2018). However, there has been a focus on using technology out of the classroom as a supportive material in a more self-directed learning environment (Lai et al., 2018). To fill this gap, the current study intended to explore the effectiveness of technology on vocabulary development by combining formal and informal settings. Thereby, the participants were encouraged to study as a group in the classroom and individually out of the classroom. The present study suggests that vocabulary learning is a demanding process that requires more practice over time and using technology provides many advantages in terms of minimizing the difficulties faced by learners for more permanent learning both in formal and informal learning settings. For this reason, research into vocabulary learning through technology by combining formal and informal learning environments among L2 learners can provide insights into practical and pedagogical dimensions.

METHODOLOGY

The current study was conducted with the aim of investigating the potential of technology as a supportive tool for boosting vocabulary knowledge by making learners more familiar with using technology for educational purposes through a quasi-experimental research design. Considering changing learning habits of learners as digital natives, it is intended to clarify the role of technology in different learning settings. Within this framework, the following questions guided the study:

1. What is the progress of learners in vocabulary knowledge during the intervention?
2. Is there a statistically significant difference between the experimental and control groups in terms of success in vocabulary development?

Participants and Setting

48 prep-class students at the English Language Teaching Department at a state university were enrolled on the course “Listening and Speaking” implemented as part of a 20-hour-instruction each week during one semester. Purposive and convenience sampling methods were applied in the creation of the experimental and control groups due to the accessibility of the participants. The participants’ possession of technological devices, the Internet access, their capabilities in terms of digital literacy were also taken into consideration in assigning the groups. Due to their proficiency levels, mostly intermediate, the participants were thought to be eager to improve themselves by using different kinds of tools and applications in a content-rich course. Both the experimental and control group students attended face-to-face courses for two hours and had online or text-based tasks that were required to be completed out of the classroom each week. The students studied the target vocabulary in the scope of the Listening and Speaking course. They were also expected to make practice and do assignments that would approximately last two hours outside the classroom. Two participants in the experimental group did not complete creative writing assignments. Therefore, the scores of the achievement test were taken into consideration through 48 participants while the creative writing assignments were evaluated through 46 participants. The learning setting with a smart board and the Internet connection was preferred. The participants used smart board, PowerPoint presentations, Word documents, online version of the coursebook, online dictionaries, audio recording, web pages, mobile phones, laptops, tablets, and Quizlet as a vocabulary

application in and out of the classroom. Google classroom was also used to communicate and assignment delivery. The researcher conducted the intervention as the course instructor.

Procedure and Data Analysis

The participants' demographic properties such as age, gender, major, the types of mobile devices possessed, the frequency and duration of using mobile devices a day, the purposes of use, the websites or applications preferred to learn a language were determined through the preliminary questions. In the light of students' answers, the control and experimental groups were created. After the creation of the groups according to students' tendencies and possession of digital devices, an orientation meeting was held to make the students familiar with the technological tools to be used and applications to be preferred. While some of the students stated that they had already used some kinds of applications to study vocabulary, some of them were not aware of these kinds of technologies. These students who had hesitations about the course were guided and encouraged about what they were supposed to do during the intervention. The intervention lasted 12 weeks during one semester in the 2019-2020 academic year. In the scope of the related course, the target vocabulary was selected according to the outcomes of each unit given in the coursebook "Oxford Q Skills for Success: Listening and Speaking". The reason for using this book is its digital content. The students were given approximately 16 words for each unit.

In the classroom, the course started with the introduction and definition of the target vocabulary set given in the coursebook. The pronunciation of the words was also given. The students were asked to match the vocabulary with their meanings. Afterward, vocabulary exercises such as filling in the blanks, choosing the proper word, and finding the equivalents were done. Through the unit, the students were encouraged to use the target vocabulary in their conversations as much as possible. After completing the unit tasks, a group game was played three times on Quizlet in the classroom environment while paper-based activities were implemented in the control group.

Out of the classroom, the students in the experimental group were directed to make more practice through Quizlet and play games such as gravity and match games in a more competitive learning environment. Although a similar procedure was followed in the control group, the activities were implemented through paper-based materials instead of using an application or any kind of technological tools.

At the end of each unit that lasted two weeks to complete, a creative writing assignment in which all target words were supposed to be used was given to the students. The students completed six different creative writing assignments during the intervention as each unit was completed in two weeks. These assignments were evaluated to understand the progress of the students throughout the whole process. With the aim of ensuring validity and reliability, a creative writing rubric was used, and creative writing assignments were evaluated by a second rater who used the same writing rubric for the evaluation. The points given by the researcher and second rater were compared and an average score was given.

In addition to the evaluation of the progress, the researcher administered an achievement test at the end of the intervention to find out whether there was a statistically significant difference between the vocabulary scores of the two groups. The achievement test was prepared in the light

of target vocabulary given in the coursebook and consisted of three categories: fill-in-the-blank activities (15 questions), matching the words with their definitions (10 questions) and sentence production (five questions). Questions in the achievement test were prepared by the researcher in line with the outcomes of the coursebook and another instructor checked them for validity. The students answered 20 questions regarding their vocabulary development. The researcher and a second rater evaluated the achievement test in line with the answer key. The points given by two raters were compared and an average grade was determined.

The quantitative data obtained from creative writing assignments and the achievement test underwent descriptive and inferential statistics to explore whether there was progress in vocabulary knowledge of the students and the vocabulary scores taken from the achievement test were statistically significant or not. According to the results of homogeneity tests, the researcher determined which type of analysis was proper for the data that may require different parametric and non-parametric analyses. In the light of normality test results, t-tests or Mann-Whitney U tests were chosen to analyze the data as comparing the changes in the percentages and the means between the control and experimental group and exploring the differences of the scores between groups were among the suggested ways in the data analysis process (Buyukozturk, 2007; Creswell, 2012).

RESULTS

Regarding the first research question, the normality test was run for the scores of creative writing assignments. The results of the Shapiro-Wilk test showed that while the data belonging to the scores of creative writings 2 and 6 had a normal distribution in both experimental and control groups ($p = .195, .178$; $p = .172, .153$, $p > .05$), the data belonging to other assignments were not normally distributed. Therefore, an Independent Sample T-test was applied to find out whether there was a statistically significant difference between the experimental and control groups' scores obtained from the creative writings of the 2nd and 6th assignments. The Independent Sample T-test results pertinent to creative writings 2 and 6 are displayed in Table 1 and Table 2.

Table 1. Independent Sample T-Test Results for Creative Writing 2

| | | Levene's Test for Equality of Variances | | t | df | p |
|--------------------|-----------------------------|---|------|------|--------|------|
| | | F | Sig. | | | |
| Creative writing 2 | Equal variances assumed | .722 | .035 | .587 | 44 | .560 |
| | Equal variances not assumed | | | .595 | 42.050 | .555 |

As seen in Table 1, there was not a statistically significant difference between the experimental and control groups regarding the students' creative writing scores 2 ($t_{(44)} = .587$, $p = 0.005$, $d = 0.175$). Therefore, it was concluded that the students in the experimental group did not outperform the students in the control group.

Table 2. Independent Sample T-Test Results for Creative Writing 6

| | | Levene's Test for Equality of Variances | | t | df | p |
|--------------------|-----------------------------|---|-------------|----------|-----------|----------|
| | | F | Sig. | | | |
| Creative writing 6 | Equal variances assumed | .109 | .000 | -.022 | 44 | .982 |
| | Equal variances not assumed | | | -.023 | 34.907 | .982 |

Similarly, Table 2 illustrated that the scores obtained from creative writing 6 did not significantly differ ($t_{(44)} = -.022$, $p = 0.982$, $d = 0.007$) between the experimental and control groups. In other words, using technological tools for creative writing did not increase the success of the students in the experimental group.

Unlike creative writing assignments 2 and 6, due to non-normal distribution of the data obtained from the scores of the experimental and control group regarding creative writing 1, 3, 4, and 5 ($p = .005$, $p = .170$; $p = .092$, $p = .004$; $p = .332$, $p = .003$; $p = .765$, $p = .028$, $p > .05$), Mann-Whitney U Test instead of Independent Sample T-test was applied. The results are displayed in Table 3.

Table 3. Mann-Whitney U Test Results for Creative Writing 1, 3, 4, and 5

| | Creative Writing 1 | Creative Writing 3 | Creative Writing 4 | Creative Writing 5 |
|------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| Mann-Whitney U | 224.000 | 251.000 | 221.500 | 263.000 |
| Wilcoxon W | 524.000 | 551.000 | 521.500 | 516.000 |
| Z | -.888 | -.289 | -.940 | -.022 |
| Asymp. Sig. (2-tailed) | .375 | .773 | .347 | .982 |

As Table 3 shows, the Mann-Whitney U Test indicated that the scores belonging to creative writing 1, 3, 4, and 5 did not differ significantly ($U = 224$, $p = .375$; $U = 251$, $p = .773$; $U = 221$, $p = .347$; $U = 263$, $p = .982$). As a result, the use of technology did not have a remarkable impact on the vocabulary skills of the students.

Regarding the second research question, it was aimed to examine whether there was progress in the students' success in vocabulary knowledge at the end of the intervention. Table 4 presents the results of descriptive statistics showing the improvement of vocabulary.

Table 4. Descriptive Statistics for Vocabulary Skill

| | Group | n | M (SD) | 95% CI | Median | Skewness | Kurtosis |
|------------|--------------|----------|-----------------|----------------|---------------|-----------------|-----------------|
| Vocabulary | Experimental | 24 | 51.46 (6.98) | [48.51, 54.40] | 53.5 | -.68 | -.81 |
| | Control | 24 | 49.37 (6.06) | [46.81, 51.93] | 49.5 | -.36 | -.26 |

Table 4 reveals that albeit the experimental group ($M = 51.46$, $SD = 6.98$) had a higher mean compared with the control group ($M = 49.37$, $SD = 6.06$), the means of vocabulary scores of the experimental and control groups were similar to each other. In this respect, to show the similarity between the groups statistically, Mann-Whitney U Test was adopted due to non-normal distribution of vocabulary scores of the experimental group ($p = .023$, $p < .05$). The results are displayed in Table 5.

Table 5. Mann-Whitney U Test Results for Vocabulary

| | Vocabulary |
|------------------------|-------------------|
| Mann-Whitney U | 224.000 |
| Wilcoxon W | 524.000 |
| Z | -1.322 |
| Asymp. Sig. (2-tailed) | .186 |

As Table 5 displays, the Mann-Whitney U Test indicated that the vocabulary skill development was not significantly greater in the experimental group than that in the control group ($U = 224$, $p = .186$). As a result, the use of technology did not provide a remarkable impact on the vocabulary skills of the students.

In brief, the analysis of quantitative data obtained from creative writing assignments during the intervention and the achievement test applied at the end of the intervention revealed that technology use in the vocabulary learning process did not remarkably affect the success of learners compared to the conventional learning process.

DISCUSSION

In the scope of the first and second research questions regarding vocabulary development during and at the end of the intervention, the researcher intended to answer whether the use of digital tools and a vocabulary learning application, Quizlet, would make a statistically difference between the scores of the experimental and control groups. The reason for inspiring the researcher to explore the impact of technology on L2 vocabulary development was research in the relevant literature pointing at the contribution of various technological tools and applications to learners' achievement level (Ghobadi & Taki, 2018; Guaqueta & Castro-Garces, 2018; Hassan Taj et al., 2017; Kabooaha & Elyas, 2018; Liu, 2016; Mahdi, 2018; Rezaei et al., 2014; Wang et al., 2015; Zou et al., 2019). However, the findings obtained from creative writing assignments during the intervention and the achievement test, in the end, showed that the scores of the two groups did not statistically differ whilst the students in the experimental group outperformed those in the control group. At this point, as the expected level of vocabulary development was not observed at the desired level in the present study, it can be inferred that technology integrated language learning did not create any statistically significant difference between the groups regarding vocabulary achievement during and after the intervention. The insignificant results of the current study can be explained with reasons such as self-directed learning as a student-related factor and the duration of the intervention, instruction, limited resources, and exam format as external factors.

The insignificance in the results may be issued from the lack of or limited self-directed learning ability of the learners as an internal factor. In their study exploring the relationship between self-directed technology use and learners' success, Lai et al. (2016) point at lack of or limited self-directed learning ability as a barrier decreasing the potential contribution of technological tools and hindering effective learning. Fathi et al. (2018) obtained significant results despite the similarities in the duration of the intervention, sample size and use of the application to the present study. García Botero et al. (2019) also point at the lack of limited self-directed learning skills for insignificant results. Considering the informal learning environment with mere out-of-class activities, it can be inferred that the students may have had difficulties taking responsibility for their learning and motivating themselves to study when they were not supported through formal learning in the classroom environment.

One of the main factors with an influence on the scores can be the duration of the intervention. Zhang et al. (2011) found parallel results in their study in which the students in the control group were as successful as those in the experimental group whilst the experimental group students outperformed the students using traditional ways to learn vocabulary in the short term. In their 4-week-study on vocabulary learning through mobile applications, Basal et al. (2016) found contradictory results with those in this study. At this point, it can be inferred that the students may have been distracted in the interventions having longer durations and the effectiveness of technological devices may have diminished.

Another possible factor affecting the results may be the scope of the instruction. Underlining the need for more instruction as a possible necessity, Tono (2011) points out that using technological tools may cause learning problems without having proper guidance and instruction in accordance with the results of his study in which learners' success was affected by their misuse of dictionaries. Regarding the current study, the participants were informed about the applications and websites to be used before the intervention in an orientation program. However, some of the students may have needed more clear instruction and modelling on how to use applications and websites in an effective way in and out of the classroom. Also, it was seen that some students in the experimental group used paper-based materials for creative writing assignments instead of using a word document. Consequently, the results may have been affected negatively by the possible lack of instruction in practical terms.

Among the possible barriers hindering effective vocabulary learning, limited resources such as access to the Internet, type of technological device, battery life, software and hardware problems can also be mentioned. Likewise, small screens of mobile phones and some technical and software problems regarding applications may have resulted in ineffective practices during the intervention. In their study on gaps in technology integration, Hew and Brush (2007) refer to this possibility by considering limited resources as the main barriers with the highest percentage in effective technology integration into education. These resource-related factors may have decreased the motivation and concentration of the participants and, consequently, affected the results negatively.

The insignificance may also be due to the exam format as an external factor. Since the participants were required to pass the proficiency exam at the end of the semester to be enrolled in the first grade, they possibly centered their concentration on the final exam. As a result, the students in both experimental and control groups studied hard regardless of the way the materials were delivered in the learning process. In other words, it can be said that the control group students

may have compensated for the limitations in traditional teaching-learning contexts through their personal efforts with extra work. Alemi et al. (2012) also reported a similar conclusion in their study in which both groups became successful in the final exam because of their extra efforts. In line with the results of this study and previous studies in the literature, it can be inferred the students who are expected to pass an exam are more motivated to have additional studies to achieve success, which may have negatively affected the results.

To sum up, unlike many studies focusing on the contribution of technological devices to vocabulary development in the relevant literature (Agca & Ozdemir, 2013; Guaqueta & Castro-Garces, 2018; Saran et al., 2012), the vocabulary scores of the experimental and control groups did not differ in the scores of creative writing assignments and the achievement test in this study. Different internal and external dynamics stated above may have affected the results.

CONCLUSION AND IMPLICATIONS

The latest learning trends and technological advancements have led learners to use various applications, websites, and digital devices as a part of the language learning process. In line with this tendency, there are many studies focusing on technology-supported language learning in the related literature. The present study, in which both formal and informal learning settings were included in the learning process different from most previous studies, examined whether technology-supported language learning had the potential to promote learners' vocabulary proficiency. The findings revealed that there was not a statistically significant difference in vocabulary development of the experimental group students compared to the students in the conventional learning setting. Despite the statistically insignificant results, the current study showed that technological tools and applications helped learners develop their vocabulary knowledge by providing alternative ways to learn vocabulary instead of using paper-based materials or dictionaries. The study also enabled learners to be more aware of the potential of technological devices in terms of language learning and gave clues about the possible difficulties faced in the process.

Referring to the limitations of the study, the absence of a pre-test could be indicated as the most prominent limitation of the study. Applying a pre-test before the intervention may have shed light on previous knowledge of learners on the target words. Another limitation that may have had a negative effect on the scores could be the differences in the way the assignments were done. Specifically, some students in the experimental group did and delivered their assignments by using a paper-based material instead of a technological tool, which may have prevented them from getting feedback in an online setting in terms of accuracy and coherence and may have been affected the scores negatively. Also, the duration of the study may have affected the results in a negative way. A 12-week process in one semester may have not showed the longer-term effects of the intervention could. Some technical problems learners had in and out of the classroom environment such as the Internet connection problems, lack of knowledge about the applications, and low battery can be stated as other limitations impeding effective learning process in the study. The evaluation process that was predominantly based on written documents can be stated as another limitation of the study besides motivated learners in terms of completing assignments and passing the written exam at the end of the semester to be freshmen students. In the light of the

findings and limitations, some practical and pedagogical implications were provided to minimize the deficiencies and problems faced in the process for effective learning.

Regarding the results of the current study, it is likely to suggest practical implications that will be helpful for teachers, instructors, and course designers who are interested in technology-supported language education. Initially, despite the statistically insignificant results of the study, most studies concluded that technology-supported language learning could provide many advantages such as promoting learners' ability to use technological devices for educational purposes, boosting interaction, collaboration, providing exposure to the target language, promoting individuality and temporal and spatial flexibility in a material-rich and authentic learning context, and offering more effective learning. Therefore, it can be stated that integrating technological tools into the education process via course syllabus and curriculum helps teachers and students have a more effective learning process. Secondly, the objectives of the course, the targeted skills, the websites or applications to be used should be clarified by taking the infrastructure of the school and ability and possession of the students into the consideration in order to obtain expected outcomes. It should be kept in mind that all learners should be able to have the Internet connection in and out of the classroom for seamless learning. They should also be aware of the problems they may face and capable of minimizing or eliminating the possible barriers.

Taking the findings of the present study into consideration, some pedagogical implications are also offered as to the integration of technological tools into vocabulary development with the aim of providing guidance for teachers, instructors, and students. Despite the insignificance of the results in the targeted skill, almost all students favored the use of technology in language learning. In this respect, technology-supported language learning as a practical way is suggested for learners and teachers to enrich the quality of the learning process, motivate learners, and minimize the negative feelings and barriers in a conventional learning setting at tertiary level. Additionally, it was concluded that there was an improvement of the target skill despite the statistically insignificant results between the groups. Especially playing games online enhanced the vocabulary knowledge of the participants besides providing the chance for more practice. Therefore, it is suggested to use different applications such as Vocab1 and WordUp to promote learners' knowledge in and out of the classroom.

The related literature and trends in language education indicate that the use of technology for educational purposes is a necessity to meet the needs of digitally native students in the modern world. Based on the findings of this study and in line with practical and pedagogical implications, some suggestions are given for further studies. With the aim of obtaining more generalizable and reliable findings, it is initially suggested to use various websites and applications according to the digital literacy and proficiency level of the students to enhance the target skill in different contexts. Secondly, it is suggested to focus on possible extrinsic and intrinsic variables such as motivation, autonomy, technical problems, and physical environments hindering success in the learning process. Lastly, learners and teachers should be informed and guided about how to use technology in the education process in an effective way before the implementation.

In brief, the current study clears the points needed to be taken into consideration such as the selection of digital tools, websites, or applications to be used, the skills aimed to be improved, the proficiency levels of the students, the digital tools the students have, the infrastructure of the school and the availability of the Internet connection out of the school, the readiness of the students

and their capabilities to use technological tools before creating a technology-supported course syllabus by teachers for effective language teaching. Innovations in the technology field including useful websites and applications for language learning have necessitated all stakeholders of the education system to make regulations for a more effective teaching and learning process. In this sense, teachers and instructors should be supported with technological and pedagogical knowledge to promote their teaching practices through digital devices so that they can be good role models for their students and encourage them to use technology for educational purposes. Having an effective learning process provided by good role models who are qualified about teaching with technology and improving positive attitudes towards learning with technology motivates pre-service teachers to use technology in their courses in the near future. In a similar vein, students should be informed about how to use digital tools for educational purposes, and they should be supported in terms of individual learning for out-of-classroom activities to be more capable of using digital tools to improve their language skills. Apart from teachers and students, administrators and curriculum designers should also be aware of the need and for technology integration into education and prepare programs according to the needs of the learners as digital natives.

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doi:10.1080/09588221.2019.1640745.

Ayşe Merzifonluoğlu is an Assistant Professor at English Language Teaching Department at Erzincan Binali Yildirim University, Turkey. She earned her Ph.D. degree at Ataturk University in 2020. She teaches EFL listening and writing. Her research interests are technology enhanced language learning, educational technologies, self-directed language learning, and interaction.

Email: ayse.merzifonlu@gmail.com

Aysegül Takkac Tulgar is an Associate Professor at English Language Teaching Department, Ataturk University, Turkey. She is also Deputy Director of the Turkish Teaching Application and Research Center. Her research interests are pre-service teacher education, pragmatic competence and glocalization in language studies.

E-mail: atakkac@atauni.edu.tr