

Investigating the Use of a Mobile Flashcard Application *Rememba* on the Vocabulary Development and Motivation of EFL Learners¹

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Abstract

The aim of this study is to investigate the effects of *Rememba*, a mobile flash card application with a spaced repetition system, on the vocabulary development and motivation of EFL students enrolled in a language preparatory program at a private university. The study also attempts to explore the perceptions of the participating students and their teacher on incorporating this mobile tool into their classroom practices. In this quasi-experimental study, 38 students at upper-intermediate level were selected. Data were gathered from pre- and post- vocabulary tests, a MALL (Mobile Assisted Language Learning) motivation questionnaire, open-ended questions and reflective journals. The findings revealed that with the implementation of this particular application, the students demonstrated a higher level of vocabulary knowledge and they felt more motivated. The findings also suggested that both students and their teacher positively perceived the use of this mobile tool while teaching and learning vocabulary in their classroom. Based on these findings, implications and recommendations to integrate mobile applications in language preparatory programs are suggested.

Resumen

El objetivo principal de este estudio es investigar los efectos de *Rememba*, una aplicación de tarjeta de memoria flash móvil con sistema de repetición espaciada, sobre el desarrollo del vocabulario y la motivación de los estudiantes de EFL de Turquía matriculados en un programa de preparación de idiomas en una universidad de fundación (sin fines de lucro, privada) en Estambul, Turquía. El estudio también intenta descubrir las percepciones de los estudiantes y del docente sobre la incorporación de esta herramienta móvil en sus prácticas de aula. Los participantes fueron 38 estudiantes de nivel intermedio superior clase preparatoria y su maestro. Los datos obtenidos en este estudio cuasi experimental fueron basados en las pre- y pos-pruebas, un cuestionario de motivación, preguntas abiertas y revistas reflexivas. Los hallazgos obtenidos revelaron que la implementación de *Rememba* resultó en incrementos significativamente más altos de vocabulario y una mayor motivación por parte de los aprendices. Los hallazgos también sugieren que tanto los estudiantes como el docente perciben el uso de esta herramienta móvil positivamente mientras se enseña y aprende vocabulario en clase.

Introduction

During the last two decades, technology has revolutionized teaching and learning across various disciplines via scaffolding, assisting and supplementing traditional classroom instruction (Fageeh, 2013). The spread of the internet has made these technologies more efficient in reshaping language pedagogy. Among these technological advances are mobile phones, which have dominated most students' lives serving not only as communication devices but also as a learning tool (Prensky, 2005). The use of mobile tools has brought about a new type of language learning called Mobile Assisted Language Learning (MALL). MALL technologies are considered convenient, easy-to-use and accessible in education institutions (Abdous, Camarena, & Facer, 2009; Kukulka-Hulme & Shield, 2007; Nah, White & Sussex, 2008). Specifically, the need for effective vocabulary teaching and learning has been a topic of interest due to the limited time in the classroom, which makes the use of MALL an enticing option. Considering this issue, mobile applications could be considered as a solution to assist students feel more motivated to study vocabulary due to their features of being free from time and space boundaries (Norbrook & Scott, 2003). Jones, Issroff, Scanlon and Blake (2006) raise the issues of freedom, fun, ownership and continuity, which explain why mobile devices are motivating. Thanks to these invaluable assets of mobile learning, students could be encouraged to study and practice the target words more beyond the boundaries of the classroom.

In this respect, with the advance of cutting-edge technology, teaching and learning a second language have started to be reshaped by the use of varied practices, such as computer-assisted language learning (CALL) software, digital portfolios, e-books, which are mostly preferred by the practitioners. However, mobile phones although popular with learners also offer great potential for learning. Since mobile phones eliminate

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time and place constraints, learners may gain considerable advantages from them by studying whenever and wherever they want. Additionally, it is a well-known fact that learners in this era are called “digital natives” and nearly all of them are somehow interested in technology, computers and especially smart phones which are an integral part of MALL. Considering the vast number of outstanding features of smart phones such as portability and immediacy, the use of smart phones can pave the way for effective learning not only inside but also outside the classroom.

Apart from MALL practices, the fact that spaced repetition, which is a learning technique that enables the user to review information at gradually increasing intervals, has a tremendous impact on long-term word retention is one of the crucial findings in the field of vocabulary learning (Nation, 2001, p.76). It is not possible for students to learn all target words after their first encounter, therefore, repetition or recycling of the words at certain intervals is highly beneficial. Studies demonstrate that spaced repetition is more advantageous than massed repetition (Baddeley, 1990). Studying target words for an hour without later revisions would be called as massed repetition. In other words, if the target words are repeated across a period of time, usually at increasing intervals, learning and retention of the words become more effective than repeating them at a single, uninterrupted period of time. On the contrary, studying the target words for 20 minutes at 5, 10, and 20-minute intervals respectively would be a spaced repetition study. Although the total amount of study time is the same in both examples, in the latter, an hour of study is spread over a longer period of time by using spaced repetition study. Studies (Baddeley, 1990; Dempster, 1987) have demonstrated better retention of the words among learners making use of spaced repetition compared to others who used the massed repetition method. That is to say, recurrent revision of the words prevents them from being forgotten.

Considering language education in Turkey, in most universities, English is the medium of instruction. Specifically, the prospective students have to improve their language skills and strategies as well as develop their vocabulary and grammar to be able to follow the undergraduate courses offered across various disciplines. However, the majority of students have difficulty in expressing themselves in the target language because of their limited vocabulary knowledge. In other words, their vocabulary competency remains limited due to the lack of self-study skills as well as the limited instruction hours in the existing preparatory programs (Altun, 1995).

In light of these observations, the present study aims to fill this gap by integrating a mobile tool (*Rememba*) to teach, learn and practice vocabulary in upper intermediate English language preparatory classes. The reason behind choosing this particular application is the fact it is based on flashcards using a spaced repetition which helps students practice vocabulary in different intervals. It is believed that, implementing such a mobile device will provide language learners with the opportunities to learn, recycle and consolidate the words they have learned not only inside but also outside of the classroom. Likewise, using smart phones as a learning tool may also increase their motivation as well as have a positive impact on their vocabulary development.

Purpose of the study

Having vocabulary knowledge within a sufficient range is a requirement in language learning for the comprehension and the expression of the target language (TL). A large number of EFL learners have difficulty in understanding and expressing both the oral and written forms of L2 (English) due to lack of vocabulary knowledge (Cameron, 2001; Nation, 2001). That is why they need more opportunities to consolidate their vocabulary knowledge. The purpose of this study, therefore, is to investigate the use of a mobile application, *Rememba*, and see its effects on the vocabulary development and motivation of Turkish EFL students at an upper intermediate level preparatory program. The study also attempts to reveal the perceptions of the students as well as their teacher on the implementation of this mobile tool to teach and learn vocabulary in their classroom practices.

Research questions

In the light of the above discussion, this study aims to find the answers to these research questions:

1. Is using *Rememba*, a mobile flash card application based on spaced repetition more effective than traditional instruction (e.g. notebook use) in the vocabulary development of the Turkish EFL students?
2. How does this application help the participants to promote their motivation to store and practice vocabulary?

3. What are the perceptions of students and their teacher about using such a mobile tool to store and practice vocabulary in preparatory classes?

Significance of the study

Mobile phones are one of the most widespread and popular technological devices in our modern age, and they play a significant role especially in young people's lives. Use of mobile technology is also growing rapidly in the field of education, since it empowers learners by allowing them to reach learning materials and study at any time and place (Ally, 2009). Likewise, it enables educators to access teaching resources without time and place restrictions and this helps teachers to make their lessons more effective. Attewell (2005) points out that the United Kingdom, Sweden, Italy and the United States are the pioneers of mobile assisted language learning. However, in Turkey the amount of research conducted on the use of mobile applications is scarce. Recent studies on mobile-learning generally explore the use of SMS or MMS. However, research on the use of mobile applications in English Language Preparatory Programs at tertiary education is scarce (Cavus & İbrahim; Kennedy & Levy, 2008; Saran, 2009; Stockwell, 2007). This study, therefore, aims to show that the mobile application, *Rememba*, can be used as an effective tool for EFL learners to consolidate target words outside of the classroom. Institutions and EFL instructors can also benefit a great deal from the use of smartphones since they enable learners to study at any time and place and make the learning process more enjoyable. The findings of this study may serve as guide for English language preparatory schools regarding the implementation of mobile assisted learning during the process of teaching vocabulary.

Literature review

Mobile Assisted Language Learning (MALL)

There has always been an attempt to come up with the most effective methods to teach a foreign language. With the advent of technology, educators have started to integrate technological tools into their teaching not only to meet the educational needs of the learners, but also to add flair to their courses (Cavus & İbrahim, 2009; Wong & Li, 2008; Stockwell, 2007; Thornton & Houser, 2005). Especially with the emergence of Computer Assisted Language Learning (CALL) in 1970s, teachers have started to employ technology in their lessons more and more (Saricoban & Ozturan, 2013). In the last phase of CALL, mobile assisted language learning (MALL) came into existence coined as "integrative CALL" which comprises various definitions by different scholars. For example, Kukulska-Hulme (2013) defines MALL as the use of mobile technologies in language learning, especially in situations where device portability offers specific advantages. Likewise, Wong & Li (2008) focus on the mobility of learning practice and emphasize the interaction between the learner and learning content, peers or the instructors which can improve effectiveness, flexibility and convenience of learning. With the emergence of MALL, foreign language curriculum has started to be reshaped since MALL technologies are convenient, easy-to-use and ubiquitous (Oblinger & Oblinger, 2005; Kukulska-Hulme & Shield, 2007; Kukulska-Hulme, 2009; Shih, 2007).

Furthermore, traditional universal instructional design principles have also been analysed and evaluated by Elias (2011) to account for mobile learning. Some of these principles such as 'equitable use', 'flexible use', 'tolerance for error', and 'instructional climate' are particularly important to MALL. In the following section, these four principles are briefly described.

Equitable use: As for mobile learning, Elias (2011) recommends the delivery of content "in the simplest possible format" (p.148). While integrating mobile technologies into language teaching, we need to make sure that the content is not confusing but user-friendly for the learners and it must be accessible by everyone.

Flexible use: Elias (2011) suggests providing the content "in small chunks". Therefore, we need to consider the fact that the resources we deploy should not be too long; instead, they ought to be "manageable learning chunks" (Bradley, Haynes, Cook, Boyle & Smith 2009, p.281). Besides, the importance of being flexible while designing mobile learning by allowing learners a space to create their own materials via mobile technologies is crucial as well.

Tolerance for error: Thanks to mobile devices, learners may have the opportunity to reach learning materials when needed. In this way, mobile learning may create a great potential to decrease learner errors by offering "just in time training and support" (Elias, 2011, p.249).

Instructional climate: With mobile learning, teachers can “push regular reminders, requests, quizzes, and questions to students” (Elias, 2011, p.148) via short message service (SMS), or free applications in an easy and free and/or affordable way.

Based on these overviews, it is obvious that MALL can provide learners with the opportunity to study without time and place restrictions both in and outside of the class and may help educators to promote learning and teaching. Specifically, the effects of using digital flashcards based on spaced repetition are the two distinctive strategies to aid with the use of mobile apps for the vocabulary practice of the EFL learners. The following section provides details about these two features of a mobile application.

Use of word cards / flash cards as a vocabulary learning strategy (VLS)

Flash cards are one of the ways to benefit from Schmitt’s (1995) and Nation’s (2001) recommended vocabulary learning strategies, where the learner studies a set of cards and tries to remember its meaning (Nation, 2001). In Schmitt’s taxonomy (1995), flash cards could be used both in the “discovery” stage, where the learners study the part of the speech, definition, synonym/antonym of the target word, and in the “consolidation” stage where they further practice the target words through flash cards. In Nation’s (2001) taxonomy of VLSs flash cards could be used to “establish knowledge”. Word cards assist students in retrieving the word meaning and the form from the memory (Nation, 2001), and thanks to them, students can learn a great amount of receptive and productive vocabulary at the first stage of word learning (Waring, 1997).

A word card can comprise of the word, a sample sentence, or a simple picture (Baleghizadeh & Ashoori, 2011). While teaching vocabulary to ESL/EFL students, or while students are preparing their cards, both sides of these cards are used. That is to say, while on the one side of the card the target word is written in L2, the other side of the card includes the translation and pronunciation. In addition, an example sentence from the dictionary could be provided to facilitate the contextual use.

Related literature on the use of flashcards in EFL contexts demonstrate that flashcards have been used for a significant amount of time not only for teaching, but also for learning purposes (Nation, 2001; Waring 1997). In some studies, flashcards were proved to be an effective way of learning vocabulary as they allow repetition and proper scaffolding of the learning as well as help teachers to demonstrate a simple sequence of activities to the learners (Akin & Seferoglu, 2004; Baleghizadeh and Ashoori 2011; Erten & Tekin, 2008; McCarten, 2007).

However, although the previous studies highlighted the use of flashcards in teaching and learning vocabulary, they did not emphasize the use of mobile flashcards in vocabulary practices. In this respect, the incorporation of mobile flash card application *Rememba* could be considered as an effective VLS for learners to consolidate the target words and expand their vocabulary competency. Specifically, by using the application, learners can create their mobile word cards by writing the target word on one side, and a synonym/definition and a sample sentence on the other side (See Figure 1&2). They can also listen to the pronunciation of the word by clicking on the icon on the right side of the card.



Figure 1: The face side of the word card



Figure 2: The back side of the word card

Spaced repetition

It is impossible to overlook the fact that repetition is essential for vocabulary learning in a foreign language. Studies in the field of memory (Baddeley, 1990) and vocabulary learning (Bloom & Shuell, 1981; Mondria, 1994) clearly demonstrate that spaced repetition is more effective than massive repetition. The difference between massed repetition and spaced repetition is that while the words are repeated “during a single and continuous period” of time in massed repetition, spaced repetition involves repeating the words “across a period generally at ever-increasing intervals” (Kukulska-Hulme and Traxler, 2005, p.77).

As for spaced repetition, for instance, the target words could be revised five minutes after initial learning, another five minutes after a few hours, five minutes on the following day, five minutes three days later and lastly five minutes a week later. Although the total amount of time allocated for studying is twenty-five minutes, it is spread across time rather than spending the same amount at a single time. Even though this may change depending on the type of words and structures, Pimsleur (1967) recommends a memory schedule which can be regarded as a guide while determining the intervals between repetitions. In this schedule, the underlying reason for determining the amount of time between spaces is that most of the forgetting occurs after the initial stages of learning a vocabulary item, and then it slows down as the time passes by.

Even though it may change depending on the type of words and structures, Pimsleur (1967) recommends a memory schedule which can be regarded as a guide while determining the intervals between repetitions. Table 3 below shows the schedule which suggests increasing spaces between repetitions. In other words, if the first interval is five seconds, then the next one may come twenty-five seconds later ($5^2=25$), the following one is $5^3=125$ seconds, the next one is $5^4=625$ seconds (approximately 10 minutes), and so on.

Repetition	1	2	3	4	5	6	7	8	9
Time spacing before the next repetition	5 secs	25 secs	2 min	10 mins	1 hour	5 hours	1 day	5 days	25 days

Table 1: Pimsleur’s Memory Schedule (Pimsleur, 1967, p.73)

In Pimsleur’s (1967) memory schedule, the underlying reason for determining the amount of time between spaces is that most of the forgetting occurs after the initial stages of learning a vocabulary item, and then it slows down as the time passes by. As it is clearly illustrated in the figure below, there is a sharp decline in the probability of retrieving a word as the seconds pass by. It shows us that if learners do not repeat the words shortly after they have learned, they will most probably completely forget them. For this reason, on the condition that we provide learners with the chances of the repetition of the new words at the right time, we can help them totally refresh their memories and retrieve the words correctly.

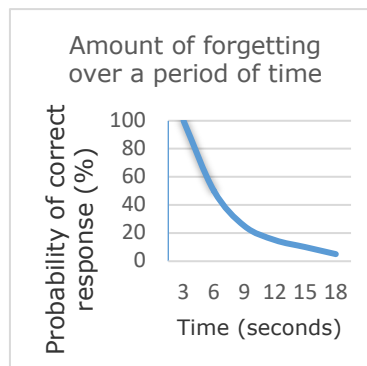


Figure 3: Amount of forgetting over time (Pimsleur, 1967, p.74)

As it is clearly illustrated in Figure 1, there is a sharp decline in the probability of retrieving a word as the seconds pass by. It shows us that if learners do not repeat the words shortly after they have learned, they will most probably completely forget them. That is why, on the condition that we provide learners with the chances of the repetition of the new words at the right time, we can help them totally refresh their memories and retrieve the words correctly.

Based on these overviews, the present study highlights the importance of the integration of *Rememba* into vocabulary learning and teaching as an effective mobile application due to its use of mobile flashcards and spaced repetition system. The application sends notifications (See Figure 4) to the learners at ever increasing intervals and reminds them to study the word cards created by the learners. In this way, it has the potential to enable learners to repeat and recycle the target words at the right time.

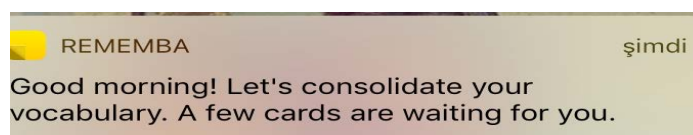


Figure 4: A notification sent by Rememba

Implementation of mobile learning into vocabulary teaching and learning in language education language

Thanks to the advances in technology, mobile learning has recently started to be integrated into foreign language education. Thereby, various studies have been conducted in order to investigate the effects of mobile learning in different aspects (Chen & Li, 2010; Cavus & İbrahim, 2009; Edge, Fitchett, Whitney & Landay 2012; Saran, 2009; Thornton & Houser, 2005; Unal, 2015). The obtained findings revealed the effectiveness of using MALL in language teaching and learning which has promoted its use in language classrooms.

Furthermore, in a study carried out by Thornton and Houser (2005), the use of mobile phones in vocabulary teaching showed that mobile phones were preferred by 71% of the participants who considered such tools as effective and useful while learning new words. In a parallel study, Edge et al. (2012) used an application called *MemReflex*, which includes adaptable flashcards and provides instant feedback, was utilized. Their study demonstrated that the application was effective in terms of audio and text modalities. The application also had a positive impact on learner accuracy, confidence, and perceptions of control and success.

Considering the Turkish context, some studies investigated the use of MALL to assist with the vocabulary development of language learners (Cavus & İbrahim, 2009; Saran, 2009; Unal, 2015). The studies shared similar findings. Specifically, the obtained results demonstrated that MALL had a positive impact on the vocabulary development of the learners as well as their thoughts learning words through mobile applications.

In conclusion, as summarized above, several studies have demonstrated that MALL has the potential to impact EFL learners' vocabulary development in a positive way. However, particularly a few studies explored the use of mobile flash cards based on spaced repetition system in language preparatory programs in Turkey. This study, therefore, aims to shed light on this particular issue and provide implications for mobile assisted vocabulary teaching and learning in EFL classrooms.

The current study

Having reviewed the related literature, it was found that despite the numerous studies conducted on mobile assisted learning, little research has examined how mobile technology may be used to facilitate other academic activities such as using flashcards based on spaced repetition to promote learners' vocabulary development particularly in language preparatory programs. For this reason, this study attempted to investigate the use of *Rememba*, to assist with the vocabulary development of EFL learners in a private university in Turkey. The research questions addressed in this study are as follows:

Considering the discussion above, this study aims to find the answers to these research questions:

1. Is using Rememba as mobile flash cards based on spaced repetition more effective than traditional instruction (notebook use) in the vocabulary development of the students learning English at a preparatory school?
2. Does using this particular application as a mobile tool to store and practice vocabulary have impact on students' motivation?
3. What are the perceptions of the students and teachers about using this app to store and practice vocabulary in English courses?

Context and participants

This study was conducted at an English Language Preparatory School of a private university in Istanbul, Turkey. The participants in this study were students studying at upper-intermediate level. The ages ranged from 18 to 22. The two intact classes at upper-intermediate level were purposefully chosen due to their accessibility to the researcher. There were 19 students in each group and 38 students in total. While the experimental group included 11 girls and 8 boys, the control group included 9 boys and 10 girls. Each class had the same teaching hours with the same teachers (6 hours per week). All the students had smart phones with an easy access to the Internet. They downloaded *Rememba* which is a free application and the instructor introduced them the app reflecting its functions and usage on the smart board. After the introduction, the instructors did a demo lesson to practice target vocabulary items with the students using this application.

Research design

A mixed method approach including quantitative and qualitative elements was used in this study. Specifically, the study was based on a quasi-experimental design including two groups, control and

experimental with an attempt to compare the impact of *Rememba* on the vocabulary development as well as motivation of the participating students as well as find out the students' and their teacher's perceptions about using this application in their classroom practices.

Therefore, to meet the objectives of this study, the quantitative data were gathered via pre- and post- test vocabulary tests and a MALL motivation questionnaire. As for the qualitative part, data were gathered from teacher's and students' reflective journals as well as open-ended questions. The following table simply displays the design and the data collection instruments of the study:

	Groups	
	Experimental	Control
Pre-Test	X	X
Treatment	X	
Post-test	X	X
Reflective Journals	X	
Questionnaire on Motivation	X	

Table 2: Research design of the study

Data collection instruments and procedure

For the purposes of the study, a quasi-experimental research design was adopted. During the study, in the experimental group, the vocabulary teaching and learning were supported by mobile assisted language learning (MALL) via the mobile application, *Rememba* whereas in the control group participants received no treatment. Specifically, vocabulary instruction in both groups were mostly delivered explicitly as it is suggested by many researchers (Coyne, McCoach, & Kapp, 2007; Justice, Meier, & Walpole, 2005; Cohen 1998); however, sometimes implicit learning opportunities were provided as well since it also enhances vocabulary learning (Nation, 2001).

Prior to the research, a pilot study was conducted to check the usability of the pre- and post- tests. A vocabulary achievement test developed by the researcher through an online tool that included 70 items. In the pilot study, the tests were administered in an upper-intermediate class including 19 students. Having analyzed the results, no changes were made in the items. Following this stage, the study was carried out with 38 students at upper-intermediate level by the end of the first semester of the 2016-2017 academic year. Before the study, permission was obtained from the head of School of Languages at the stated institution.

Before the implementation, a smart phone use questionnaire was administered to the students in the experimental group to gather data about their demographics and smart phone use. As the first step in the study, a pre-test was given to the two groups on the same day. The test comprised of 70 multiple choice questions where the students were asked to read the sentence and choose the correct word from the given options (see Appendix A). Following this, the mobile application "*Rememba*" was introduced in the experimental group. Simply, the students were informed about the procedures regarding its use in and outside of the class. At the end of the first week, the implementation of the mobile application started. Starting from week 1 to the end of week 7, each week students created digital word cards on their smart phones using the app.

To begin week 1, they created 10 cards based on of the introduction of the mobile application. In weeks 4 and 7 they also created 10 cards because in those weeks, there were fewer teaching hours due to the midterm and final exams. In the other weeks, the students created 20 word cards each week. Meanwhile, with regard to their experiences about this implementation, each week the students and the teacher kept reflective journals (see Appendix C) to reinforce the quantitative data about the impact of digital word cards based on a spaced repetition system. Specifically, they were provided with some prompts and questions to reflect on related to the use of this application in their classroom practices. At the end of week 7, the post-test was conducted to see the differences between the vocabulary developments of both groups.

After the post-test, the MALL motivation questionnaire (see Appendix B) was administered in the experimental group in order to see the effects, if any, of the application on the participants' motivation. The questionnaire included two parts. The first part was originally developed and used by Fageeh (2013) in a study to investigate the effects of MALL applications on vocabulary acquisition and motivation of the EFL learners. It included 10 items and the items of the original questionnaire were adapted including the MALL application *Rememba*. The second part consisted of 7 open-ended questions exploring the students' use of the mobile application and their perceptions about it. The questions in the second part were adapted from

a questionnaire developed by Saran (2009) and used in a study to explore the use of mobile phones for supporting vocabulary acquisition of English language learners.

Instruction in the experimental group. This group received 4 hours of vocabulary instruction each week except week 4 and 7. In week 4, two hours, in week 7, three hours of vocabulary instruction was given since during these weeks the students took the midterm and final exams. As for the instruction in this group, the target words were taught in context using Power Point Presentations with related visuals. Following the vocabulary instruction, the students created their own digital word cards using the mobile application "Rememba" (Figure 2 & 3). On their cards, the students wrote the target word on the one side and the synonym/antonym/definition of the word on the other side with a sample sentence. During the second, third, fifth and sixth weeks, the learners created 20 word cards by choosing the target words from the official word list of the related week. Besides, in week 1, 4 and 7 the students created 10 word cards since extra time was allocated for the introduction of the mobile app during the first week, and there were fewer teaching hours in weeks 4 and 7.

Every week approximately two hours were allocated for the creation of the digital cards in the class. A word card on Rememba included the target word with its part of speech on one side, and a synonym/antonym/translation/definition plus a sample sentence on the other side. While the students were creating their cards in the class, the teacher checked their sample sentences for accuracy and meaning, and provided technological guidance related to the content. Upon creating the cards, the students shared their own cards with the other students via the application and added them to their own accounts.

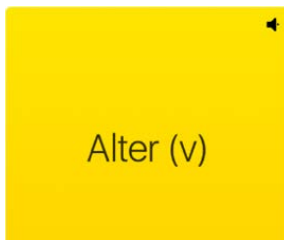


Figure 5: The face side of the word card

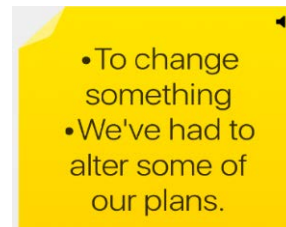


Figure 6: The back side of the word card

Previously, it was mentioned that "Rememba" encourages users through spaced repetition by sending notifications at certain intervals. The intervals between the notifications are closer once the students add the cards to the system which increase in time to help students remember the word easily (Baddeley, 1990; Pimsleur, 1967). In other words, since this application is based on spaced repetition system, it helps learners retrieve the words soon after the learning takes place by sending notifications at ever-increasing intervals. Figure 4 below shows the memory schedule of a student offered by the application.

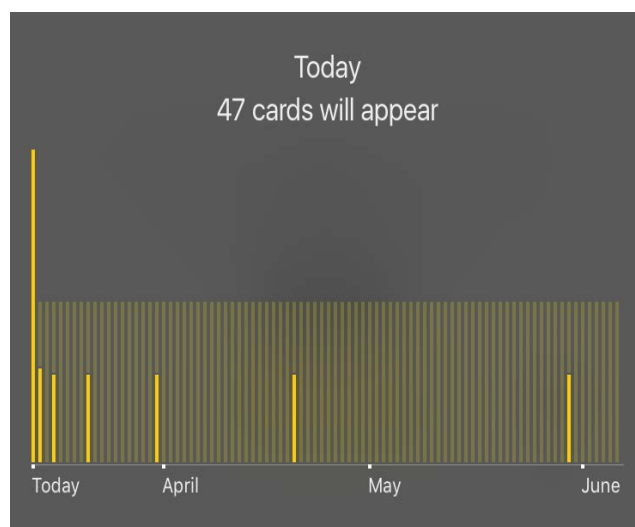


Figure 7: Memory schedule of a student

In addition, the application sends the same notifications mentioned above to the students about reminding them to revise the cards, it has the potential to create a "push effect", which is suggested by Elias (2011) as one of the instructional design principles for MALL. In this way, teachers can easily send learners

reminders about assignments or weekly expectations, which could be effective in pushing the learner into action (Stockwell & Hubbard, 2013).

As for the interface of the application, it seems user-friendly and simple. The content was created in the "simplest possible format" (p.148) as proposed by Elias (2011); therefore, the word cards just included the word with its part of speech on one side, and its meaning and an example sentence on the other side. Hence, it was appropriate to facilitate learning in small manageable chunks (Bradley, 2009).

Instruction in the control group. The control group received the same amount of vocabulary instruction as the experimental group by the same instructor, and they were exposed to the same target words. The same materials were used while introducing the target words, and they were mostly taught explicitly using PPT presentations including the target word with its part of speech, a picture related to it, an example sentence, and collocations (Coyne et al., 2007; Justice et al., 2005). Yet sometimes implicit learning opportunities were created as well (Nation, 2001) by introducing the target words in a reading text or listening and expecting the students to deduce the meaning themselves. However, the students in the control group were not exposed to the mobile application *Rememba*, so they did not create any word cards due to the traditional instruction provided by the teacher. In other words, they were not given the opportunity to make any flashcards on paper. They just listened to their teacher who presented the word followed by practice and production based on a handout including the target vocabulary.

To wrap up, both groups received instruction by the same teacher using the same materials with the same teaching hours. The only difference between the two groups regarding vocabulary teaching/learning was the use of the mobile application by the participants enrolled in the experimental group.

Data analysis

In this study, to analyze the pre- and post- vocabulary tests, an independent sample t-test was performed using SPSS (Statistical Package for the Social Sciences) version 23. In this way, the vocabulary development of both groups before and after the implementation were compared. The level of significance for the statistical analyses was set at .05. As for the students' motivation using *Rememba* while learning target words, percentages were calculated and reported through SPSS.

To complement the quantitative data, qualitative data were gathered through reflective journals kept by the participants and the teacher/researcher and the open-ended questions. The process of data analysis followed the content analysis steps recommended by Granheim and Lundman (2004). First, the transcription of journals and open-ended questions was done, and then, examined several times to obtain a general and accurate understanding. All the data was grouped as units including notes that were analyzed and coded. In addition, meaning units were formed including the words and sentences related to each other in terms of content. In other words, the meaning units were compiled based on their content and provisions. Then, they were conceptualized and given a code. Once the codes were identified, they were compared and contrasted as well as grouped under specific categories. Next, the compared codes were grouped under "themes" and "subthemes". A deeper analysis associating the main themes with the research questions to seek answers and evidence from the data was conducted by the two researchers. Finally, after the content analysis, frequency counting was conducted regarding each student's and teacher's reflections and answers to the open-ended questions obtained during the qualitative data collection process.

To identify the degree of agreement between the two researchers regarding the development of themes and subthemes, the inter-rater reliability was calculated and found to be .86, which indicated close agreement between the two raters on the general themes apart from the different verbalizations of similar concepts (McHugh, 2012).

Results

The present study aimed to investigate the use of a mobile application, *Rememba*, and to identify its effects on the vocabulary development and motivation of EFL learners. The study also aimed to explore the perceptions of students and the teacher on the implementation of this mobile tool to teach and learn vocabulary in the classroom. The following section explains results in accordance with the research questions addressed in this study.

Comparative results on the students' vocabulary development

In this section, the means and the standard deviations for the experimental and control group on the pre-test, post-test and their gain scores are presented in Table 2 to investigate the effects of the treatment on

the vocabulary development of the participants. The gain scores, which means the difference between the pre- and post-test scores, of the experimental group was 35.4 while it was 27 for the control group. The results revealed that the performance of the experimental group on the vocabulary test was better than the control group.

	M	N	SD	SEM
Control Pre-test	20.05	17	3.99	.96
Control Group Post-test	47.05	17	6.59	1.59
Experimental Group Pre-test	17.00	15	7.22	1.86
Experimental Group Post-test	52.47	15	7.68	1.86
Control Gain Scores	27.00	17	3.87	.93
Experimental Gain Scores	35.40	15	3.50	.90

Table 3: The Differences between the gain scores of the two groups

In order to determine if the difference between the gain scores of both groups was statistically significant, an independent samples t-test was conducted using SPSS. As shown in Table 3 there was a significant difference between the groups ($p < .05$) in terms of their gain scores on the vocabulary test. Participants in the experimental group got statistically more vocabulary items ($M=35.4$, $SD=3.50$) than the students in the control group ($M=27$, $SD=3.87$); $t(32)=2.20$, $p=.03$. In other words, using the mobile app outside the class increased the correct use of the target words in the experimental group.

Levene's Test for Equality of Variances					
	F	Sig.	t	df	p
Average of differences between the scores of pre- and post- test	1.67	.20	2.20	32	.03

* $p < .05$

Table 4: The comparative results of the two groups

Students' motivation after the implementation of Rememba

As for student motivation using this app, the obtained findings demonstrated that 73% of the participants ($n=15$) felt captivated while using their smart phones to learn new words. Additionally, 66.6% of the participants reported that they felt motivated, and 66.7% of them thought that using *Rememba* to learn new vocabulary was great fun. As for the convenience of the application, nearly 75% of the students believed that it was easy to study and learn new words with their parts of speech and usages using *Rememba*. In addition, 59 % of the participants stated that they would continue to use it in the future.

Another interesting finding was the change in the participants' study habits, and regarding this, 66.7% of the participants reported that they had developed an *e-lifestyle* (i.e. technology-oriented study style) using *Rememba* on a daily basis to practice new words. The gathered findings indicate that while 53.3 % of the students preferred digital word cards, 33.3% of them stated they were neutral and 13.3 % reported that they preferred paper-based cards. This suggests that although slightly more than half of the participants would like to use digital word cards, there were still some students who preferred paper-based word cards. The reason behind this finding might be the convenience of using mobile apps and the minimal cost in language classrooms as they already possess smart phones and the apps are free.

Moreover, 72.7% of the participants reported that they could get more vocabulary tasks done by working on their smart phones compared to working with paper and pencil sheets. Yet, there are studies that have shown more retention when students write and take notes by hand (Mueller & Oppenheimer, 2014). This finding contradicts that larger body of literature maybe because using this mobile application was convenient for the learners, and they had the opportunity to revise the target words whenever they wanted. Another finding makes it clear that the students preferred to use their smart phones more when they believed it was convenient and practical. Also, the majority of them (66.6 %) stated that they were increasingly engaged in learning vocabulary via mobile devices compared to paper and pencil methods.

Lastly, a great majority (87.6 %) reported that over time, smart phones had become less of a distraction and more of a tool for learning new vocabulary for them. To sum up, the findings of the MALL Motivation Questionnaire indicate that the mobile application *Rememba* had a positive impact on the majority of the participants regarding their motivation. However, there were still few students who believed that studying on paper was more useful for them compared to digital word cards.

Students' perceptions about using Rememba

The questionnaire included open-ended questions to gather data about student perception (see Appendix B, part II) concerning the use of the mobile application, *Rememba*. The initial question (see Table 4) was posed to learn about the reason why the participants liked, if they did, the application. 19 students responded to that question and the results as demonstrated in Table 4 revealed that 6 of them liked the application, since it sent them notifications as a reminder to repeat the word cards. In addition to this, five of the respondents reported that they liked using *Rememba* because it helped them retrieve the words easily, and two of them stated that it encouraged them to practice the newly learned words. Being a convenient way to prepare word cards, were among the reasons why the students liked the application utilized. Only one student expressed that he did not like the application as he did not like using technological devices in general.

In brief, nearly all the students liked the application and the main reasons for it were that it facilitated the retrieval of the words, and the feature of sending notifications acted as a push effect as it encouraged them to study and repeat the newly learned words. The students' quotes can be seen in Table 5 below.

Responds	Students
It helps me to remember the words easily	S1, S2,S3,S11,S19
The feature of sending notifications	S7,S11,S12,S13,S14,S15
I can listen to the pronunciation of the words	S4
An easy way to repeat the words	S6
Helps me to learn L1 meanings	S9
It encourages me to study / repeat the words	S10,S18
Makes it easy to prepare word cards	S15
Helps us to study the words whenever we want	S19

Table 5: What are the *Rememba* features you like the most? Why?

Another open-ended question addressed the features of the application that the students dislike and the reasons why (see Table 5). Twelve out of 19 students responded to the question and the responses are shown in Table 4., Also, six students stated that there was nothing they disliked about the application. It is worthwhile to note that four of them reported that they did not like it because it sent too many notifications. Also, one student expressed that he did not like the colors of *Rememba* and another respondent pointed out that it was tiring to prepare word cards using the application.

Responds	Students
Nothing	S6,S7,S8,S10,S12
It sends too many notifications	S1,S2,S3,S11
Colors are not nice	S4
It's tiring to prepare	S5

Table 6: What are the *Rememba* features you dislike?

The final open-ended question aimed to identify whether the students consider the application an effective method for the vocabulary development or not. The findings indicated that 17 out of 19 students thought it was an effective method to study and practice vocabulary. Seven of them reported that it was useful as it sends them notifications to repeat their word cards and so it helps them retrieve the words easily. Also, they stated that it helped them keep the words in their memory for a long time, which means they felt that they could keep the words in their long-term memory since they repeated the words at certain intervals thanks to the notifications sent by the application. Another finding was the convenience of the application. Two students mentioned they could reach the word cards with L1 meanings of the words whenever they wanted, therefore, they considered it as a useful method to study vocabulary. The last reason why they liked the application was that the word cards included their own example sentences consisting of the target word. On the other hand, two students stated that they did not find the application as an effective method thinking that it was not appropriate for their learning styles. However, almost all the students considered that *Rememba* a useful method to benefit from for their vocabulary development. Only two were opposed to that idea since they believed that their own learning strategies were more effective. Table 6 displays the students' quotes regarding this particular question.

Responds	Students
Yes	S1, S2, S3, S4, S5
Yes, it helps us to remember the words and make them permanent	S6, S9
We can reach it at any time and learn the L1 meanings of the words	S7, S13
Yes, thanks to its notifications it reminds the words that we are likely to forget	S11, S14, S15, S16
Sending frequent notifications is a successful method	S17
Notifications make the words stay in our memories for a longer time	S18
Yes, when we repeat the words after receiving notifications, makes the learning process easier	S19
Yes because we learn the words with our own example sentences	S12
No, everybody should have his/her own method	S8
It is not appropriate for my learning style	S10

Table 7: Do you think using *Rememba* is an effective method to study vocabulary? Why?

Students' reflections on using Rememba

The findings from the student reflective journals were analyzed through content analysis. Six main categories were identified: convenience of the mobile application, its push effect, facilitating the retrieval of the words, other factors making it a useful vocabulary learning strategy, negative opinions about it, and suggestions by the students to improve *Rememba*.

Convenience of the mobile application. The findings of the reflective journals gathered from the students revealed that they found the mobile application convenient to use as they could access their smart phones whenever and wherever they wanted. The following excerpts support this finding:

[...] I can use it everywhere when I am home, at school, on the bus etc... (S1, Journal Data, 03.02.2017)

[...] It is like a pill to learn vocabulary; you can use it whenever you want; For example, when you are on the bus you can just take out your mobile phone and revise your word cards. (S10, Journal Data, 16.02.2017)

Based on the students' comments, *Rememba* was considered as a useful tool since it provided easy access to the word cards without time and place restrictions. Simply, the feature of being ubiquitous made *Rememba* a convenient tool for EFL learners to study vocabulary.

Push effect of the mobile application. The findings gathered from the reflective journals indicated that the mobile application used had a positive impact on the students since it encouraged them to study by sending them notifications at certain intervals. Regarding this finding, some of the students said:

[...] The feature of sending notifications as a reminder to study the word cards makes it a great application. (S18, Journal Data, 03.03.2017)

[...] Sending notifications at regular intervals makes us repeat the words and makes learning easier. (S2, Journal Data, 07.03.2017)

In brief, by sending notifications at certain intervals, *Rememba* encouraged students to study the word cards on their smart phones. It had a push effect on students, which could be considered as a motivational factor for students to study vocabulary on their mobile phones. To put it simply, the notifications sent via *Rememba* led the learners to study the target words at spaced intervals.

Eased word card retrieval. In their journals, students reflected that using *Rememba* helped them retrieve the newly learned words easily and keep the words in their long-term memory as illustrated in these comments:

[...] I used to learn a word but forget it immediately. However, now thanks to the notifications I repeat the words, so I can remember them easily. It is good for long-term retention. (S8, Journal Data, 07.03.2017)

[...] I learned all the target words in week 1. Now I can remember how to use them better. (S2, Journal Data, 27.01.2017)

In brief, the students expressed that using *Rememba* assisted them in the retrieval of the target words and assisted with moving words to their long-term memory. While using this application, they did not have difficulty recalling previously learned words and they could remember them easily.

Other factors making Rememba a useful tool for the vocabulary development of the learners. As for the other factors that make *Rememba* a useful tool for the vocabulary development, participants pointed out four major points. First of all, they stated that this app helped them to learn the vocabulary items with their parts of speech. In addition, seeing the words in context, thanks to example sentences, gave them a better understanding of using the words productively. Also, repetition, an important component of vocabulary learning strategies, supported their vocabulary development by expanding their vocabulary knowledge. Lastly, the students thought that studying vocabulary by means of *Rememba* was fun. The excerpts below support these findings:

[...] Thanks to repetitions, I expanded my vocabulary knowledge a lot. (S9, Journal Data, 07.03.2017)

[...] If we use this application regularly, we can learn the words with their parts of speech, and thanks to the example sentences, we can see how a word is used accurately. So, we don't have difficulty while writing an essay. (S15, Journal Data, 10.02.2017)

[...] It is not boring, it is encouraging and useful. (S18, Journal Data, 10.02.2017)

The students' reflections showed that *Rememba* was perceived as an effective tool since it helped students study the words with their parts of speech, example sentences, and repetition in a fun way. This application helped them to benefit from some useful vocabulary strategies without getting bored.

Drawbacks of Rememba. Despite the fact that the majority of the students shared their positive perceptions about *Rememba*, some of them expressed the negative sides of using this app. For example, one student did not like it because in his view technological tools were boring for studying. Another student did not favor it because of having different study habits such as studying on a paper. Finally, a student faced battery problems. These drawbacks were demonstrated below:

[...] I think it is boring because I don't like using technological tools very much. (S14, Journal Data, 10.02.2017)

[...] I like studying on paper. It is more useful for me. (S6, Journal Data, 03.03.2017)

[...] I don't like it because of the battery problem. (S17, Journal Data, 03.03.2017)

Overall, the reflections of the students revealed that some of them did not like using this application due to various reasons. Therefore, the drawbacks of using a mobile app as a vocabulary teaching and learning tool should be closely addressed in English courses.

Suggestions to improve Rememba. As for the findings related to the suggestions on how to improve *Rememba*, the participants suggested that pictures, videos, a dictionary, tests and games could be integrated into the application. They also suggested that ready-made word cards could be provided, and users could just add an example sentence to the card to personalize it. Considering these viewpoints, the students said:

[...] There could be pictures and videos in the application. (S3, Journal Data, 10.02.2017)

[...] Adding tests and games to the application could be better. (S4, Journal Data, 10.02.2017)

In sum, taking the comments made by the participants above into consideration, the mobile application *Rememba* could be improved by integrating other features such as pictures, videos, tests, games, and a dictionary. In this way, it could be more attracting and motivating for the users.

Teacher's reflections on using Rememba

In an attempt to gather data about the teacher's perceptions, the reflective journal kept by the teacher was analyzed. The findings were categorized into four main themes, which are the motivation of the learners, changes in their study habits, learner vocabulary development and the problems observed by the teacher.

Motivation of the learners. Based on the observations made by the teacher, most of the students seemed motivated and eager to utilize the application throughout the study. They only hesitated to use it during the first week. Considering this point, the teacher said:

[...] Although in the first week some of the students were not so eager to utilize the application, now they seem more eager to use it. It is maybe because they have become more familiar with the application and had a better understanding of the benefits it could potentially bring for their vocabulary development. (T, Journal Data, 03.02.2017)

[...] *Majority of the students were on task when they were asked to prepare their word cards on their smartphones* (T, Journal Data, 16.02.2017)

Based on the findings of the reflective journals, the students were motivated and willing to use the mobile application in their courses. Therefore, it can be said that *Rememba* had a positive impact on the motivation of the learners in terms of vocabulary learning and teaching.

Changes in the study habits of the learners. As for the study habits of the students, the findings indicated that *Rememba* had a positive impact as it encouraged the students to study. The students received a reminder and they started to practice vocabulary regularly. The following comments support this finding:

[...] *It seems to have a positive effect on their study habits as they are repeating and recycling the words at certain intervals thanks to the application.* (T, Journal Data, 10.02.2017)

[...] *Generally, students study vocabulary just before the vocabulary quiz but now I see that they repeat the words outside of the class every day thanks to this application. So, it seems that the application has had a push effect on students by encouraging them to study.* (T, Journal Data, 16.02.2017)

The comments made by the teacher showed that the push effect of *Rememba* led to positive changes in the study habits of the students. They were willing to use this app to practice vocabulary on a regular basis.

Vocabulary development. Considering the vocabulary development of students, the teacher's reflections revealed that using *Rememba* helped them to retrieve the newly learned words. Additionally, the students could identify the parts of speech of the target words correctly and produce sample sentences. Some of the teacher's reflections are presented in the excerpts below:

[...] *While I was trying to elicit the meanings of the week 3 words they seemed to be slightly better at remembering and retrieving the target words compared to the control group.* (T, Journal Data, 10.02.2017)

[...] *While eliciting the parts of speech of the target words of the week, they were able to answer correctly most of the time.* (T, Journal Data, 24.02.2017)

Based on these reflections, it is apparent that the use of *Rememba* eased the retrieval of the newly learned words for the students. Besides, the students were better at identifying the parts of speech of the target words and use them accurately and meaningfully.

Problems observed. The analysis of the teacher's reflective journal showed that particularly two students were not motivated to use *Rememba* due to having different learning strategies. The other problems observed were related to technical issues such as battery and storage problems. These quotations support the gathered findings:

[...] *A student did not want to prepare her word cards on her phone claiming that she needs to charge her phone.* (T, Journal Data, 03.03.2017)

[...] *Again, the same students (S6, S11) seemed unwilling to study on their mobile phones. When I asked them about the reason, S6 told me that he had a different method to study vocabulary which worked well all the time. He contends that his method is the best way to study vocabulary for him, so he is not into any different methods.* (T, Journal Data, 03.02.2017)

In light of the teacher's reflections, the students with different learning styles experienced some difficulties with using this app. Others had some technical problems. These issues should be addressed while using this application in language classrooms.

Discussion

The purpose of the present study was to investigate the impact of the mobile flash card application, *Rememba*, on the vocabulary development of the EFL learners in upper intermediate level preparatory classes in Turkey. The results indicate that there was a significant difference between the gain scores of the vocabulary tests received by the experimental and control groups. In other words, the experimental group that received the treatment of using the mobile application had quite a positive impact on the vocabulary development of the target group of students. One of the reasons why the use of this application resulted in better vocabulary achievement results might be due to the fact that it is based on a spaced repetition system, which makes the learners repeat the word cards at certain intervals. This argument is in line with the research (Mondria & Mondria-De Vries, 1994) which has shown that learning new words via spaced repetition of flashcards is an effective way to quickly expand one's vocabulary knowledge. Specifically, all

these studies including the present study clearly revealed that the use of the mobile app led to better vocabulary retention.

Another reason why using this tool had a positive impact on the vocabulary development of the learners might be because of its push effect thanks to the notifications it sends to the users. The results are in accordance with the study of Warren and Meads (2014) which demonstrated that the use of push notification had a considerable effect on user retention in comparison with the non-digital applications. In other words, the use of push notification functions as a reminder and encourages learners to utilize the application. To put it another way, *Rememba* reminds learners about the repetition of the word cards; thus, students could be more likely to be encouraged to study the target vocabulary on a regular basis.

In addition to the push effect of *Rememba*, the flash cards in the application could be considered as "manageable learning chunks" (Bradley et al, 2009, p.281) because students write short example sentences and short definitions of the words on their word cards. Therefore, it was unlikely that it created a cognitive load on the learners' memory while using the application. It seems that the students also see it in the same way since they stated that it was easy to remember the newly learned words thanks to this application. This finding was echoed in the study conducted by Saran (2009) where multimedia messages including small amount of information were sent to the learners for vocabulary learning/teaching. In this way, the cognitive load was reduced, and it was found out that the students receiving multimedia messages learned more word items than the ones studying on web and paper-based materials.

Last but not least, as it is noted by Kukulka-Hulme (2013) and Cavus and İbrahim (2009), the portability of mobile phones and SMS text messaging offers distinctive benefits for learners such as serving as an effective mobile learning tool to teach and learn English vocabulary providing learners with the opportunity to study and practice without time and place restrictions. Similar to these studies, in the present study, the students had a chance to access the word cards they prepared in the class via mobile phones whenever and wherever they wanted, which could facilitate vocabulary learning beyond the borders of the classroom. In other words, mobile phones created "continuity between contexts" (Jones et al. 2006) and could support learning processes in different places without depending on one particular location or time.

Furthermore, this study attempted to find out the impact of the mobile application *Rememba* on the motivation of the participating students. In order to gather data regarding motivation, the MALL motivation questionnaire was administered after the treatment in the experimental group. The results revealed that a great majority of students liked using the application to learn vocabulary which had a positive impact on their motivation. To illustrate, nearly all the students considered using this mobile tool as an easy way to practice newly learned words. They stated that they found the app enthralling, fun and convenient which are among the motivational factors of MALL as suggested by Jones et al. (2006). These findings are also in line with the studies conducted by Fageeh (2013) and Huang, Yang, Chiang and Su (2016) attempting to investigate the advantages of mobile applications concerning their potential for reinforcing vocabulary learning and motivation.

However, it is essential to keep in mind that studying vocabulary using mobile devices may not be motivating for some students who did not like learning through technology much. The reasons stated by the students were not being willing having a different learning strategy and study habits. This finding is in line with a study carried out by Okunbor and Guy (2008) to investigate the use of mobile phones to enhance student learning. The obtained results indicated that most of the students using the mobile-based applications found them insignificant.

In brief, despite the fact that using *Rememba* was found to be motivating for most of the students in this study, there were still a few students who were not motivated to study vocabulary on their mobile phones. Therefore, it is important to note that there is still a need for further research regarding the motivational issues in mobile learning (Sharples, 2007). It is also crucial to respect students' learning styles while showing them different ways for vocabulary learning so that they can find what is best for them.

As the final step of this study, the reflective journals of the students and their teacher clearly showed that the majority had positive opinions about *Rememba* as a mobile tool to store and practice vocabulary. First of all, the students pointed out that it was a very convenient way to study vocabulary as they could access to their word cards at any time and place. In addition to this, the application sent them notifications at spaced intervals to remind them of the revision of their cards. Therefore, it created a "push effect", which is which encouraged them to study vocabulary on a regular basis.

Another reason why the students and the teacher participants had positive perceptions toward the use of *Rememba* was due to its features. The majority of students expressed that practicing vocabulary using this app was not boring which was related to the findings by Basoglu and Akdemir (2010) who emphasized the effectiveness, convenience and entertaining use of mobile tools to teach and learn vocabulary.

Another interesting finding from the students' reflective journals was that the students considered *Rememba* as a useful tool since to develop new vocabulary learning strategies. Considering the strategies, the students mentioned that being exposed to the part of speech of a word, its L1 meaning and an example sentence was beneficial for their vocabulary development. These vocabulary learning strategies are also suggested by Schmitt (1995) as a part of the "discovery" stage as well as McCarthy (1990) who contends that learning a word in a meaningful context is the best way to acquire and recall a word. This finding is also in line with the ones gathered from the teacher's reflective journals as the teacher noted that the learners in the experimental group seemed to be better at recalling the meanings of the target words with their part of speech and coming up with example sentences.

Finally, for the problems experienced by the students and the teacher during the use of *Rememba* was related to battery and storage. This shows that technical problems may create an obstacle while studying vocabulary through MALL which was also confirmed with the studies conducted by Al-Said (2015), Saran (2009) and Perry (2003). Another problem reported by both the students and the teacher was the lack of motivation experienced by two specific students. These aforementioned students were reluctant to use the mobile application since they did not like technological tools a lot and believed that they could learn better when they study on paper. Therefore, it is noteworthy to stress that educators need to take different learning strategies preferred by students into consideration while adopting mobile technologies in their classrooms.

Conclusion

The present study contributes to the literature by investigating a mobile flash card application with a spaced repetition system on the vocabulary development and motivation of EFL learners enrolled in a preparatory program in Turkey. Apart from some limitations related to the sample size, time constraints and lack of word cards prepared by the control group, the obtained results indicate that the participants who used *Rememba* had better vocabulary gains. Moreover, the results demonstrate that the students, in general, were motivated to use the application and mostly shared positive perceptions in their journals. Apart from the vocabulary development and motivation, both the students and their teacher had positive perceptions about integrating such a mobile application in their classroom practices.

Based on these findings, the present study offers some practical implications for practitioners, course/material designers and researchers. First, the findings of the present study revealed that using the mobile flash card application can aid with the vocabulary development of language learners and affect their motivation positively. In addition, the students stressed the remarkable features of this app such as being convenient and fun, and having the push effect. They also found it effective for their vocabulary development since they were exposed to the target words in context along with their L1 meanings and parts of speech at certain intervals. Therefore, language teachers should consider the option of using mobile applications to practice and revise vocabulary both in and out of the classroom. However, it is crucial to keep in mind students who preferring paper-based methods as they could resist using such a mobile application. Therefore, piloting and receiving students' feedback are highly suggested before adopting such a mobile application in EFL classrooms. Briefly, the findings of the present study demonstrated that integrating *Rememba* during the process of vocabulary teaching and learning could be considered as an effective tool to support the vocabulary development and enhance their motivation in EFL classrooms.

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Appendix A

Vocabulary Test

Part I. Personal Information

1. Name:
2. Age:
3. Gender: Female/Male
4. Major:
5. High School:
6. Do you have a smart phone?
Yes/No
7. How long have you been using a smart phone?
0 – 6 months _ 6 – 12 months _ 1 – 2 year _ 2 – 4 years _ more than 4 years _ Never used_

Part II.

Choose the correct option to complete the sentences below. Choose only one option.

1. The plan received _____ support throughout the country.
A. widespread
B. innovative
C. sensitive
D. skilled
2. Rome was the _____ power in the Mediterranean region for many centuries.
A. innovative
B. predominant
C. sensitive
D. steady
3. The government _____ gambling.
A. distributes
B. regulates
C. comprises
D. declines
4. Ability to read is _____ to getting an education.
A. neutral
B. fundamental
C. permanent
D. notion
5. What's done is done, and we cannot _____ the fact.
A. alter
B. employ
C. conform
D. transmit
6. Charities _____ food and medical supplies to people who are in need.
A. employ
B. distribute
C. comprise
D. decline
7. We'll need to _____ more waiters during the summer.
A. invest
B. alter
C. employ
D. distribute
8. The fitness centre _____ a pool as well as racquetball courts.
A. comprises
B. invests
C. conforms
D. pollutes
9. He found it difficult to _____ to the strict rules of the military academy.
A. conform
B. regulate
C. invest
D. comprise
10. The _____ that the earth moved around the sun was unacceptable to church leaders of the time.
A. application
B. distribution
C. investment
D. notion
11. The accident has not done any _____ damage.
A. depressed
B. permanent
C. sensitive
D. notion
12. France's population is _____ Catholic.
A. meanwhile
B. predominantly
C. virtually
D. steadily

13. Last year, there was a _____ in the number of crimes in the city.
 A. distribution
 B. regulation
 C. decline
 D. caution
14. The government makes the laws, and the police _____ them.
 A. claim
 B. discriminate
 C. pose
 D. enforce
15. They hoped the negotiations would _____ an end to the war.
 A. indicate
 B. bring about
 C. claim
 D. enforce
16. The civil rights movement fought to bring an end to _____ in this country.
 A. regulation
 B. conformity
 C. discrimination
 D. decrease
17. The woman on the phone was _____ a survey.
 A. enforcing
 B. posing
 C. claiming
 D. conducting
18. The topic of war _____ the conversation.
 A. enforced
 B. dominated
 C. indicated
 D. expressed
19. The results of the study _____ that their hypothesis was correct..
 A. claim
 B. indicate
 C. dominate
 D. conduct
20. The advertisers _____ that their product cleans better than similar products.
 A. cope
 B. bring about
 C. conduct
 D. claim
21. We may be fearful of change, but change is _____.
 A. incentive
 B. fundamental
 C. inevitable
 D. willing
22. The manager's resignation _____ several problems for the restaurant's owner.
 A. discriminated
 B. dominated
 C. enforced
 D. posed
23. How do you _____ with the stress of this job?
 A. conduct
 B. cope
 C. regulate
 D. employ
24. The competition gave the students a/an _____ to read more books.
 A. indication
 B. anxiety
 C. expression
 D. incentive
25. The customer's violent behavior _____ the store manager to call the police.
 A. committed
 B. expressed
 C. compelled
 D. indicated
26. I couldn't sleep last night and _____ was tired all day today.
 A. meanwhile
 B. virtually
 C. furthermore
 D. consequently
27. He was always _____ to play an instrument when he was young, but now he wishes he had.
 A. committed
 B. reluctant
 C. willing
 D. facilitated
28. These two statements _____ each other, so I don't understand your point.
 A. injustice
 B. facilitate
 C. contradict
 D. compel
29. The company wanted to buy the property for a new hotel, but the owners were not _____ to sell.
 A. reluctant
 B. permanent
 C. risky
 D. willing
30. No arguments could _____ him from taking on this dangerous task.
 A. compel
 B. deter
 C. participate
 D. indicate

31. The _____ of nuclear power claim that the probability of serious accident is very high.
- communities
 - opponents
 - exceptions
 - deter
32. No parking is allowed, but a /an _____ is made for disabled drivers.
- prejudice
 - facility
 - exception
 - shortcoming
33. His business connections _____ his finding a new job.
- committed
 - adapted
 - facilitated
 - deterred
34. We are committed to fighting against poverty and _____.
- opponent
 - injustice
 - participation
 - willing
35. Despite a number of _____, the project will still go ahead.
- shortcomings
 - indications
 - unions
 - outcomes
36. Who do you think _____ the crime?
- created
 - reminded
 - eliminated
 - committed
37. The town council _____ buying fruits and vegetables which are grown on local farms.
- alters
 - utilizes
 - advocates
 - presumes
38. Many scientists had _____ this disaster, so necessary precautions were taken.
- comprised
 - advocated
 - foreseen
 - utilized
39. Punishment for even small crimes could be _____ in those times.
- enrolled
 - severe
 - socialized
 - foreseen
40. He called the police after she made _____ on his life.
- implementations
 - advocates
 - threats
 - cautions
41. A good government is concerned with the _____ of its citizens.
- requirement
 - welfare
 - incidence
 - underclass
42. There is a _____ amount of space in your closet, so you need to throw some things out.
- threat
 - steady
 - finite
 - vast
43. The time is now right to _____ our plan.
- implement
 - dominate
 - pose
 - ban
44. She was wearing a white coat, so I _____ she was the doctor.
- facilitated
 - advocated
 - presumed
 - contradicted
45. Wearing uniform is not _____ in most of the high schools in Turkey. Students do not have to wear them.
- controversial
 - foreseen
 - compulsory
 - finite
46. In the famous opera, the gypsy, Carmen, _____ her own death.
- reduces
 - predicts
 - implements
 - maintains
47. Turkey's European Union (EU) membership is a/an _____ issue. While some people support it, some people oppose this idea.
- finite
 - severe
 - underlying
 - controversial
48. Vitamin C helps the body to _____ the iron in your body.
- utilize
 - threat
 - pursue
 - elect

49. Water is a _____ for all living things.
 A. pursue
 B. policy
 C. requirement
 D. welfare
50. We expected the restaurant to be busy, but we were surprised to find it _____ empty.
 A. consequently
 B. temporarily
 C. virtually
 D. steadily
51. Thomas Edison possessed a/an _____ mind; he always tried to produce new ideas and methods.
 A. acknowledged
 B. innovative
 C. equivalent
 D. incentive
52. The city's orchestra is _____ to be one of the world's finest.
 A. distributed
 B. banned
 C. contributed
 D. acknowledged
53. The report _____ that the company made a loss of £20 million last year.
 A. implements
 B. invests
 C. reveals
 D. cautions
54. The workers are _____ the new rules and they are protesting against them.
 A. conforming
 B. resisting
 C. revealing
 D. predicting
55. You should drive with extreme _____ if you don't want to risk your life.
 A. caution
 B. resist
 C. recovery
 D. pursue
56. My father has made a full _____ from the operation. Now he is very _____ healthy.
 A. perspective
 B. stability
 C. recovery
 D. caution
57. The company's _____ is to fire an employee after two warnings about being late.
 A. capacity
 B. policy
 C. dependence
 D. requirement
58. For a _____ child, changing schools is difficult.
 A. innovative
 B. conservative
 C. primitive
 D. sensitive
59. The company's profits have been increasing _____, so it is getting bigger and bigger.
 A. virtually
 B. reluctantly
 C. steadily
 D. consequently
60. Don't be afraid to _____ your goals.
 A. pursue
 B. require
 C. resist
 D. caution
61. Britain had _____ influence over the entire Indian subcontinent. Y
 A. allocated
 B. extensive
 C. current
 D. sensible
62. Dolapdere and Kasımpaşa are the areas in İstanbul with a high _____ of crime.
 A. incidence
 B. policy
 C. investment
 D. recovery
63. They _____ most of their money in the stock market.
 A. pursued
 B. invested
 C. admitted
 D. recommended
64. A large amount of money has been _____ for buying new books for the library.
 A. revealed
 B. indicated
 C. allocated
 D. deterred
65. Bob spent fifteen months alone on his yacht. Ann, _____, took care of the children on her own.
 A. virtually
 B. meanwhile
 C. furthermore
 D. strictly
66. The space program requires the _____ of large amounts of money.
 A. expenditure
 B. violating
 C. meanwhile
 D. policy

67. She is highly _____ and always tries hard to win.

- A. priority
- B. allocated
- C. competitive
- D. severe

68. Their new software _____ made huge profits last year.

- A. priority
- B. shortcoming
- C. allocated
- D. enterprise

69. Your children should be given _____ over your own needs.

- A. expenditure
- B. competition
- C. enterprise
- D. priority

70. Thirty-four protesters were arrested for _____ criminal law.

- A. violating
- B. polluting
- C. allocating
- D. employing

Appendix B

MALL motivation questionnaire

This questionnaire is designed to gather information about your opinions concerning the mobile application "*Rememba*". There are two parts in this questionnaire. The first part includes 10 and the second part includes 8 questions. Please give your honest opinion. Your honest opinion is critically important for this study. Your personal information will not be shared by any third-party entities for their commercial, marketing or other purposes.

PART I.

1. I feel enthralled using smart phones to learn English vocabulary.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
2. I feel more motivated to study vocabulary when I use "*Rememba*".
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
3. It is great fun to learn new vocabulary via *Rememba* application on my smart phone.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
4. Using *Rememba* application on my smart phone makes it easy for me to look up and learn new words, their parts of speech and their usages in illustrative examples.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
5. I will continue to use *Rememba* application to learn and actively use newly learned vocabulary.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
6. I have developed an e-lifestyle using *Rememba* frequently, on a daily basis, look up and learn new words.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
7. I prefer to use the digital word cards over paper based word cards.
 - Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree

8. I am increasingly engaged in learning vocabulary via mobile devices compared to paper and pencil methods.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
9. Over time, smart phones have become less of a distraction and more of a tool for learning new vocabulary.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree
10. I can get more vocabulary tasks done when I am working on my smart phone than when I am working with paper-and-pencil sheets.
- Strongly Agree
 - Agree
 - Neutral
 - Disagree
 - Strongly Disagree

PART II.

1. Did you repeat the word cards after receiving notifications?
Yes _ No _
If No, please explain the reason? _____
2. How many times did you repeat the word cards in a week?
1 _ 2 _ 3 _ 4 _ 4+ _ Never _
3. What do you think about the notifications sent to you?
Too few_ Few_ Enough_ A lot_ Too many_ I should receive ___ notifications a day
4. What are the *Rememba* features that you like? Why?
5. What are the *Rememba* features that you dislike? Why?
6. Do you think that *Rememba* is an effective method to study vocabulary? Why?
7. Do you want to add any other things about *Rememba*?

Appendix C

Reflective Journals

For students

- 1- Reflect on your experiences you have had so far while using *Rememba*.
- 2- Do you think *Rememba* is a useful tool to study vocabulary? Why? Why not?
- 3- Reflect on how using *Rememba* has affected your motivation in terms of vocabulary learning.
- 4- Reflect on how using *Rememba* has affected your vocabulary development.
- 5- How does *Rememba* help you, if it does, study and practice vocabulary?
- 6- What are the weaknesses of *Rememba*? Do you have any suggestions to improve it?
- 7- Reflect on your experiences you have had so far while using *Rememba*.

For the teacher

- 1- Reflect on your observations regarding the effects of *Rememba* on the vocabulary development of the students.
- 2- Reflect on your observations regarding the effects of *Rememba* on the motivation of the students.
- 3- Reflect on what you have observed while students are studying on *Rememba*.