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Original Article

The Impact of a Custom-Made Vocabulary Application on the Vocabulary Recognition of Iranian EFL Learners

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Abstract

Vocabulary Guru (VG) is a custom-made mobile application (app) developed based on the task model and agile methodology via qualitative needs analysis. This investigation intended to assess the impact of VG on EFL learners'vocabulary recognition. First, 84 academic vocabularieswere selected, based on their frequencies defined by the Corpus of Contemporary American English (COCA) (Davies, 2017) and the Academic Core Vocabulary Website (Davies & Gardner, 2019). From 141 university students, 60 intermediate female students were selected who were randomly assigned to an experimental group and a control group. The experimental group practiced the target vocabularies via VG, whereas the control group learned them via the conventional method. A vocabulary recognition test was developed and administered twice to both groups.Finally, two paired samples t-tests and two independent samples t-tests were utilized to estimate within and between-groups differences. The findings revealed that the experimental group outperformed the control group significantly.

Keywords: Agile Methodology, Mobile Assisted Language Learning, Needs Analysis, Task Model, Vocabulary Guru

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1. Introduction

English language as a lingua franca connecting people in today's global village, and vocabulary as the fundamental cornerstone of language use, have made teaching English vocabulary one of the most pivotal aspects of Teaching English as a Foreign/Second Language (TEFL/TESL)(Bowles & Cogo, 2016; Schmitt & Schmitt, 2020). Furthermore, the outgrowing penetration of technology, especially mobile devices in human life, has made the concept of everyware practical(Greenfield, 2010). Also, the facilitative and enhancing effect of using mobile technology on teaching/learning different dimensions of language, including the possible affordances, has been observed frequently in the literature (Tai & Ting, 2020). Hence, usingEveryware, i.e.,Vocabulary Guru (VG) in the current study,to learn/teach vocabulary seems plausible.

Pervasive computing has led to the emergence of numerous mobile apps in various language teaching/learning areas. According to Kukulska-Hulme and Shield (2007), technology as everyware can foster learning the English language as a lingua franca. Also,the literature suggests that mobile devices, smartphones, and mobile apps bring about promising and positive progress in TEFL/TESL and elevate motivation and learning vocabulary(Klímová, 2018).

In the earlier studies, the focus has been either on the theoretical dimensions of MALL or the impacts of utilizing the apps that have already been developed, but not for their particular subjects and settings(Chan et al., 2006; Foomani & Hedayati, 2016; Jafari & Chalak, 2016). Heil et al. (2016) stated that "despite a pedagogical shift toward more communicative approaches to language learning, these apps are behaviorist in nature"(p. 1). Taghizadeh (2019) emphasized that"needs analysis is considered a first necessary step in designing a course"(p. 1). Moreover, curriculum development is rooted in needs analysis; furthermore, learners'motivation is mainly derived from their desire and needs for learning English (Al Amrani, 2019).

Regardless of the importance of sociocultural aspects of education, which enhance learning processes, pervasive computing still is technology-centric;hence, it requires more investigation on human-computer users and societal intelligence with the help of location-aware language learning systems (Goumopoulos & Mavrommati, 2020; Helm, 2015; Hwang et al., 2008).

Notwithstanding what mentioned above, the researcher could not find any mobile app custom-made for particular participants following their specific needs. Therefore, the current study attempted to compensate for the gaps stated aboveto assess the impact of utilizing VG on EFL learners'vocabulary recognition, based on agile methodology discussed and used in the studies carried out byFlora et al. (2014).

1.1 Theoretical Framework of the Study

Teaching vocabularies based on the incremental feedback received from the learners and the findings of needs analysis is a dynamic procedure that requires a dynamic theoretical framework. In this regard, the task model for mobile learning centers around post-method principles and agile methodology(Kumaravadivelu, 2006; Taylor et al., 2006). Furthermore, the dynamic inter-relationship among various factors involved in a pedagogical settingare the building blocks of the task model; in fact, the tasks, the subjects, the objectives, as well as the related technologies, are all integrated within the task model framework(Sharples et al., 2007). Therefore, due to the dynamic nature of teaching vocabularies based on the incremental feedback obtained from the learners and the findings of the needs analysis, VG was developed based on the task model's principles and its integration with agile methodology;furthermore, the agile methodology fits well within the post-method paradigm, and yields itself well to the post method parameters (i.e., Particularity, Practicality, and Possibility).Hence, the task model and agile methodology were adopted as the main theoretical framework of this research.

2. Literature Review

2.1. Mobile Technology Apps

2.1.1 Affordances of Mobile Apps in Language Learning

Greenfield (2010) emphasized that the presence of mobile technology in numerous areas of human life has made the technology itself invisible. This penetration has massively affected education, especially by using different mobile apps. Due to language learning's communicative and interactive nature, using mobile apps can enhance and facilitate language learning. In this regard, Mehdipour and Zerehkafi (2013) mentioned that mobile technology is portable, adaptable, and useful in the learning process; it also provides learners

with modern ways to learn a language; these features led to a growth in using mobile apps for pedagogical purposes.

Klímová (2018), carried out a literature search in Web of Science, Scopus, and ScienceDirect; accordingly, using mobile apps improves learning English as a foreign language. Also, the positive effect of using mobile apps and games was highlighted. The enhancing impact of mobile affordances was highlighted by Lin and Lin (2019). Theymentioned that vocabulary learning, short message services, multimedia message services, and mobile applications had received increasing attention in research fields. They studied the findings of (quasi-) experimental investigations between 2005 and 2018 regarding L2 word retention. The results revealed "a positive and large effect of mobile-assisted L2 word learning interventions"(P. 1).

2.1.2Mobile Assisted Language Learning Studies

The impact of using mobile apps on language learning has been addressed in many studies. Nushi and Eqbali (2017)introducedDuolingo, a free mobile app that uses translation to teach a foreign language. They mentioned that Duolingo is following the constructivist paradigm in second language learning and encourages peer-to-peer collaboration.Duolingo provides the learners with various types of practices such as translation, matching, pairing, listening, and speaking exercises. Studies show improvement of the learners'language abilities.Basal et al. (2016), via a quasi-experimental design, studied the effectiveness of using mobile apps on teaching 40 English idioms which were selected from the Michigan Corpus of Academic Spoken English (MICASE); the corpus included recent speech recordings of 152 academic lectures over 197 hours from the University of Michigan between 1997 and 2001(Simpson & Mendis, 2003). The findings revealed that the experimental group performed significantly better in the posttest.

Alternative methods of language assessment such as interviews, portfolios, classroom observations, peer-assessment, and self-assessment have been investigated by many language scholars in the realm of assessing English language proficiency (Earl et al., 2002). Samaie et al. (2018)studied the impact of self- and peer-assessments via WhatsApp, a social networking application, on English language learners' oral proficiency, including vocabulary knowledge.In their study, 30 Iranian EFL learners used WhatsApp for self- and peer-assessment.They reported that interactive use of the app enhanced the process of

learning and increased the learners' oral proficiency meaningfully. One of the other social apps, which is used by many people worldwide for various purposes, including educational objectives, is Instagram. To investigate the impact of using Instagram for educational purposes, Liliia and Gulnara (2016)carried out a study at Kazan Federal University, Russia.They examined the effect of using Instagram on improving50 advanced EFL learners' listening skills. They used a mixed-methods design through which they revealed "the efficiency of a mobile application, Instagram, as an online educational environment for learning EFL" (P. 1).

One of the major resources used by language learners to expand both the breadth and depth of their vocabulary knowledge is a dictionary. In this regard, the impact of using mobile dictionaries was studied by Rahimi and Miri (2014). Thirty-four lower-intermediate language learners participated in this quasi-experimental study. They reported that using a mobile dictionary improves language learning if the level of difficulty is controlled. Furthermore, Jafari and Chalak (2016) investigated the role of WhatsApp in teaching vocabulary to Iranian EFL learners at Junior High School. There were 30 male and 30 female high school learners in Isfahan. The researchers found that using WhatsApp had improved both male's and female's knowledge of vocabulary.

2.1.3. Studies Carried out with no Special Mobile App

Malekzadeh and Najmi (2015) stated that using a simple messaging system of mobile devices increased Iranian upper-intermediate EFL learners' guided writing skills. However, they did not use any particular mobile app in their study. The design of the study was quasi-experimental, with 30 male participants in both experimental and control groups. In a study conducted by Foomani and Hedayati (2016), based on a seamless learning design, the participants shared the photos and images they had prepared according to the concept of the idioms they had already learned in class. No particular mobile app was used for sharing photos and images. The findings showed that using mobile devices had a positive impact on learners' autonomy, interaction, and self-reported improvement.

2.2. Inadequacies of Traditional Methodologies

Traditional methodologies of software development are highly structured and inflexible (Khalifa & Verner, 2000); for instance, the life cycle of the Waterfall model, which

is widespread, is document-driven, rooted in a frozen design that does not permit iterative enhancements, since system requirements must be defined entirely prior to the implementation phase. Contrary to the traditional software/app development methodologies, agile methodology is customer-centric. Hence, the participants' interactions, relationships, and especially their tele-collaborations, besides their needs and feedbacks are all vital to the life cycle of the app development. Therefore, system evaluation focuses on these elements and their functionality to develop the software/app in less time, rather than predetermined plans, documentations, and numerical assessment.

Chan and Thong (2009) mentioned that traditional software development methodologies follow two main pre-assumptions: first, they assume that customers do not know their requirements, whereas the developers do, and second, customers cannot foretell what are the probable requirements and necessities, so developers should provide them with foreseen extra affordances for the probable needs that may emerge later. They also highlighted that according to agile methodology, not only are customers not entirely aware of what may be required before encountering the situation but also the developers are not omniscient in this regard. Hence, their interaction and cooperation with each other during pre-release, on-release, and post-release phases of the app development is fundamental and necessary.

2.3. The Shortcomings of the Developed Apps

Regardless of the numerous MALL improvements mentioned above, there are still different shortcomings reported in the following studies. These aspects can be the source of research in the field of developing mobile apps.

Lin and Lin (2019)mentioned the positive aspects of the studies carried out between 2005 and 2018 and stated that "the effectiveness of mobile L2 vocabulary learning remained inconclusive"(P. 1). Heil et al. (2016) remarked that the developed apps do not mirror the principles of their educational context; neither were they tailored to suit a particular audience's unique needs.Burston and Athanasiou (2020) researched 2000 MALL projects from 1994 to 2018. The findings revealed that there were prominent inadequacies of the designs, not enough participants, and not long enough sessions for teaching; besides, the findings were not quantifiable.

In none of the reviewed studies, a mobile app was custom-made to teach English language learners the English language. Moreover, according to the investigation carried out by Heil et al. (2016) in the realm of MALL studies, either an available mobile app was utilized, or a theoretical concept of MALL was approached. They stated that "despite a pedagogical shift toward more communicative approaches to language learning, these apps are behaviorist in nature"(p. 1). Therefore, it seems plausible to use a custom-made mobile app to alleviate some of the shortcomingsof the reviewed studies. As mentioned before, VG is a custom-made mobile app that was developed for the participants of the current investigation.

This study aimed to explore the impact of the custom-made VG on the participants'vocabulary recognition. Hence, the following research question was posed:

Does implementing a custom-made mobile app (i.e., VG) have any significant effect on Iranian EFL learners' vocabulary recognition?

3. Methodology

3.1. Design and Context of the Study

The current study was carried out based on a quasi-experimental design. Due to the limitations of the academic and educational systems, only 6 available classes were chosen, though, after homogenizing them, they were randomly assigned to the experimental and the control groups.The independent variable is using VG, the dependent variable is the participants' degree of vocabulary recognition, and the control variables are the gender and proficiency level of the participants.The experimental group practiced the target vocabularies via VG, whereas the control group learned them via the conventional method of teaching vocabulary (i.e., Presentation, Practice, and Production). The sampling procedure was carried out in Islamic Azad University Tehran Central Branch by 2018.

3.2. Participants

The researcher of the current study could only choose the participants from his available classes. Therefore, a convenience sampling method was employed for choosing the participants of the current study. Since female learners outnumbered the male ones, gender was controlled, and the participants were all female. Accordingly, from 141 students in six intact classes, 60 female students were selected based on the results of a B1 preliminary

test. Therefore, the participants were 60 female Persian-speaking Iranian EFL learners whose ages ranged from 18 to 35 years, and all had formally studied English for two years, majoring in English language and literature. Table 1 demonstrates the demographic data related to the participants:

Table1.

Demographic Background of the Participants

Groups	Gender	N	Age Range	Field of Study	Native Language	Educational Foundation	Academic Year
Experimental	Female		18 - 35	EFL	Persian	IAU	2018 - 2020
Control	Female		18 - 35	EFL	Persian	IAU	2018 - 2020

3.3. Instruments

According to Sharples et al. (2007) and Taylor et al. (2006) any sort of material, content, device, and alike, such as electronic media and devices as well as books, maps, paintings, and the like that are used in the process of learning/teaching, are all different varieties ofinstruments. In this way, they even consider language, society, and culture as instruments which are consumed during the learning process; in this regard, the following sections elaborate on the instruments used during the current study.

3.3.1. Vocabularies as Instruments

Based on the above-mentioned, the targetvocabularies, which were used during the current study, were considered to be tools or instruments. The main criteria for selecting the target vocabularies were the domain and the frequencies of the words. These aspects are discussed in the following sections.

3.3.1.1.Domain and Frequency of the Selected Vocabularies

Hiebert et al. (2019) defined the difficulty level of vocabulary as the indices of the frequency of appearance in written language, age of acquisition, and utility in different content areas. It was emphasized that words'frequency influences virtually word recognition tasks. Therefore, the frequency of wordsis defined as a criterion for word selection.

Accordingly, the target words were selected based on their frequencies in 120 million words of academic texts in the Corpus of Contemporary American English (COCA) (Davies,

2017), and the information obtained from the query interface on the Academic Core Vocabulary website (Davies & Gardner, 2019). To choose the number of words to be taught in each session, the researcher considered the capacity and limitations of human memory, discussed by Baddeley et al. (2019).

3.3.1.2. Memory and Vocabulary Selection

In the current study, considering the time and memory limitations, seven words were selected to be taught in each session, based on the criteria of word selection already discussed in the current paper. Hence, 84 academic words were selected to be taught via VG in 12 sessions during 12 academic weeks.

3.3.2.B1 Preliminary Test

A B1 Preliminary, formerly called Cambridge English Preliminary (PET), was administered to capture the subjects'initial differences and select homogenous candidates to include in the experimental and the control groups. To estimate the internal reliability of the test scores, Cronbach's alpha coefficient was estimated as 0.74.

3.3.3.Technology as a Tool(VG)

VG was utilized as a tool to teach the target vocabulary to the participants of the experimental group. Each VG lesson consisted of seven words, their phonetic representations, their meanings in English, and their translations in Persian (See Appendix A). The participants were provided with sample statements,including their relevant audio files in American English, to contextualize the vocabularies. Since VG was developed by the researcher of the current study (Kazemainy et al., 2020), its integration within the principles of the task model and agile methodology during its life cycle is discussed briefly next. VG's life cycle and the experimental group's treatment were in constant dynamic interaction with each other. The relationship between learning, teaching, and app development and their integration within the total system are demonstrated in figure 1.

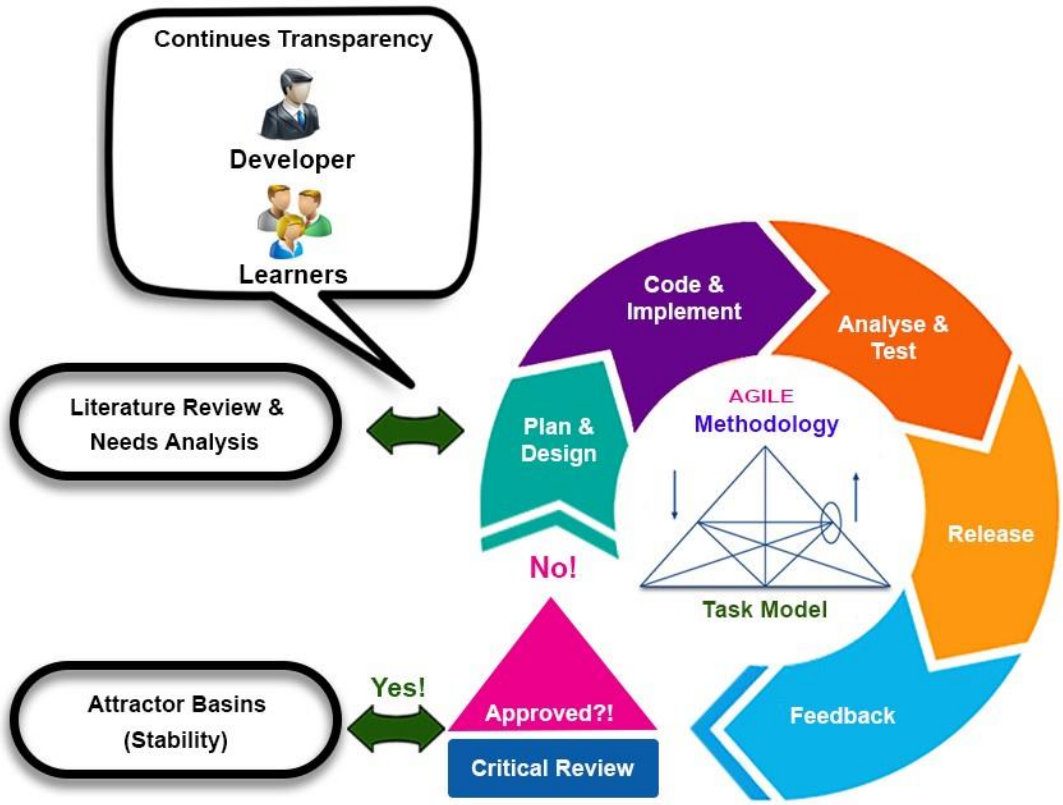

Figure 1. The Algorithm and Flowchart of VG Development.

According to figure 1, there was a constant and dynamic mutual inter-relationship among different components of the task model, interacting with the participants of the study, based on the principles of agile methodology, during the life cycle of VG.To shed more light on the dynamic procedure of developing VG, the tool integration process is discussed next. In the current study, it was a simultaneous parallel counterpart of the treatment in the experimental group, which was deployed during the experimentation. To find out how a communicative tool was added to VG, the communicative facet of the task model, and how it was mapped into VG's affordances, based on agile methodology's principles, are elaborated on next.

Tools are crucial for teaching/learning processes, but they should not be predetermined without any needs analysis and mutual interaction with the participants of a study (Flora et al., 2014). Also, tools have various dimensions and include not only material, content, instrument, device, but also language, society, and culture that are the foundations of teaching/learning processes, according to the task model (Sharples et al., 2007; Taylor et al., 2006).

The task model's communicative facet includes six levels: social setting, isolated learners, loose couples, tight couples, communication within a group, and cooperation. To find out the necessary aspects to be integrated within VG, the researcher prepared a semi-structured interview to detect students' expectations and demands in this regard. The findings of the semi-structured interview revealed that the participants were willing to cooperate during the study. Hence, in the next phase, the researcher mapped this need to the task model's foundations to pinpoint the required conceptual aspects of affordances that could provide the participants with the communicative functionality they expected to access via VG. Accordingly, the researcher moved alternatively between existing theories or etic and the emergent qualitative findings or emic. Then, he used his expertise, tact, and methodology rooted in the principles of the post-method era (Kumaravadivelu, 2006), to detect the appropriate tool/s to be integrated into VG. Finally, a chat module, and later a forum module, was added to the next two VG versions to account for the above-mentioned participants' feedback and needs. All of the tools and affordances of VG have gone through the same dynamic procedure to be added to its final version (Kazemainy et al., 2020).

3.3.4. Quizzes

After each session, the experimental group participants were provided with an online drag and drop quiz based on seven words they had learned (Appendix B). During the quizzes, the learners were supposed to recognize which word is suitable for a special blank, and fill in the blanks with the appropriate words. The quizzes could be repeated as many times as necessary automatically followedby the immediate online feedback. The control group went through the same process but in paper and pencil. Due to the nature of paper and pencil quizzes, there could be done only once with not receiving any kind of immediate feedback.

3.3.5. Vocabulary Recognition Test

The researcher developed 12 fill-in-the-blank test items as the current study's pre and posttests based on the 84 selected target vocabulary to measure the participants'vocabulary recognition. Each test itemconsists of 7 blanks.The participants in both groups were required to select the most appropriate words from a list of seven words via VG in the experimental group or via the conventional method of presentation, practice, and production in the control group. The test scores'reliability, estimated by the KR-21 formula, was 0.84 for the pretest

and 0.79 for the posttest scores. Furthermore, two experts in TEFL confirmed the content validity of the tests.

3.4. Data Collection Procedure

During the first phase, 141 university students in six intact classes were selected based on a convenient sampling method. Next, a B1 preliminary Cambridge test was administered to capture their initial proficiency levels. Then, 60 female students whose scores were between one standard deviation above and below the sample mean were chosen as the study participants. Finally, the classes of the 60 chosen participants were randomly assigned to control and experimental groups. Afterward, the researcher-made test of vocabulary recognition was administered to both groups to capture the initial differences of the participants of the study. The third phase was devoted to teaching the target vocabulary in both groups.

In the experimental group, VG was utilized by the participants outside the classes at their own pace; they were required to learn seven words each week with the meanings of the words in English, the audio files, their phonetic representations, and their translations in their shared mother tongue, followed by automatic online quizzes of vocabulary recognition.The learners were supposed to read the contextualized example sentences while listening to the related audio files. They were also encouraged to make their sentences based on the examples. During the session, the participants were able to share their VG experiences via chat rooms, discussion forums, and online assistants included in the mobile app. Because the life cycle of VGwas based on agile approach within the framework of the task model, the mutual interaction and negotiation between the teacher and the learners had a crucial role in determining the dynamic process of selecting andpracticing the vocabularies. VG was custom-made in 18 months through an incremental process, alongside its implementation, to teach/learn this study's target vocabulary. Accordingly, after a qualitative needs analysis, each session, seven words were presented via VG to the learners, and then their feedback was taken as a base for the next session implementation. Therefore, the design and VG facilities were incrementally modified with each new iteration of the app.To sum, during 12 academic sessions, the 84 selected target words were practiced by the experimental group via the custom-made VG.

To keep the records of the participants'activities, a learning management system was integrated into VG; therefore, the participants were required to login into their accounts to access their home pages inside VG to be able to use the affordances. In the fourth week, during the face-to-face class discussions in the experimental group, the researcher found out that some participants could not access their accounts. After considering and analyzing their feedback, it was found out that the dilemma originated from multiple reasons, such as forgotten or mistyped passwords, usernames, and alike. This issue produced much stress among the participants of the study. They were so worried that they could not log in to learn and would fall behind the course schedule if it happened again. To eliminate the spot issue, the participants requested the facility to call the researcher by phone if any problem occurred. Therefore, it was necessary to provide the participants with immediate help and guide in case such a problem emerged. First, the researcher ensured that the problem would be considered and eliminated soon. Then, to meet the new requirement, the researcher mapped the new demand to the task model's facets. The necessity of integrating a new communication tool that could handle telecollaboration was detected. Following the principles of a phonetic iterative analysis (Tracy, 2020), to decide which communicative tool could fulfill the task, the researcher delved into the literature, consulted various resources available via the internet, and finally made up his mind to integrate an online live chat module inside VG so that the participants could ask for help or guide anytime even before logging in to the app. As a result, an online live chat module was added to the app, and the new version was released to receive further feedback from the participants (See Appendix C).

Figure 2 depicts graphically how the findings of the needs analysis interact with the facets of the task model based on the principles of agile methodology during a tool integration cycle.

The first version of VG was developed based on literature, the expectations and objectives of the target participants, and most importantly, the dynamic methodology of the researcher of the current study, as is discussed by Kumaravadivelu (2006).

The control group practiced the target vocabulary in the classes via conventional presentation, practice, and production method. First, the researcher presented seven targetvocabulariesin each session. He pronounced each target word orally and then asked the control group students to repeat them a couple of times to ensure that they all learned how to pronounce them correctly. Next, the phonetic symbols were written on the whiteboard,

and the students were supposed to take notes for future study. Then, the target words were used one at a time in a sentence taken from the Cambridge Online Dictionary (the sample sentences were the same as those of the experimental group). Finally, the students were required to use the words in their sentences to ensure that they have learned them contextually. Feedback and error corrections were provided on the spot by various techniques based on the situation's necessities, such as self-correction, peer-correction, and finally, teacher-correction if the first two techniques did not work. Therefore, seven words were taught each session for 12 successive academic weeks (84 target words). As the third phase of the study, the parallel researcher-developed test of vocabulary recognition wasadministered to bothgroups as thefinal step to measure their scores compared to the pretest results.

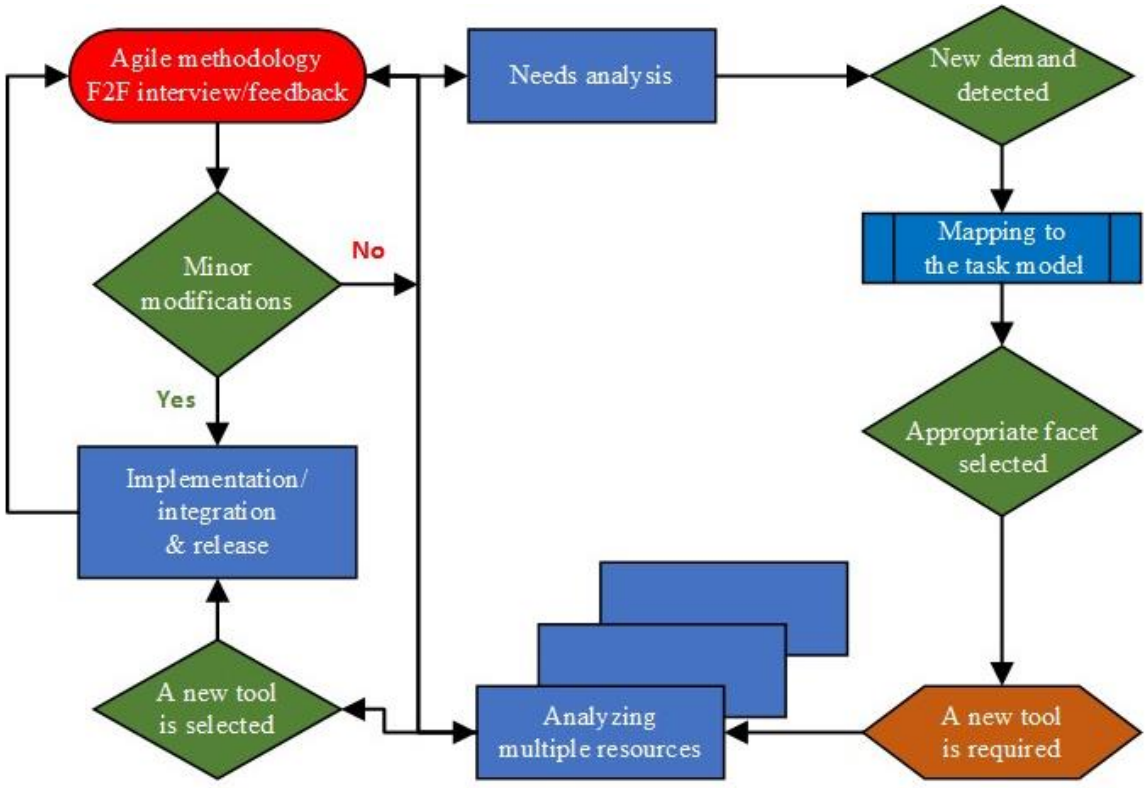

Figure 2. Interaction between Agile Methodology and the Task Model.

3.5. Data Analysis Procedure

In order to find out whether or not using VG has meaningfully increased the participants' degree of vocabulary recognition, the data obtained from the researcher-

developed test of vocabulary recognition, were analyzed. Table 2 depicts the descriptive statistics of the scores obtained from the current study's pre and posttests for both the experimental and the control groups.

Table 2.

Descriptive Statistics Related to the Scores of the Experimental and the Control Groups in Pre and Posttests

Groups	pairs	N	Mean	SD	Std. Error Mean
Experimental	Voc. Pretest	30	12.43	5.348	0.976
	Voc. Posttest		36.33	4.188	0.765
Control	Voc. Pretest	30	13.57	6.038	1.102
	Voc. Posttest		23.37	5.951	1.086

Subsequently, the researcher investigated the normality of the distribution of scores to meet the requirements of the t-test as a parametric test. Accordingly, it was found out that the scores obtained from the vocabulary recognition pre and posttests were approximately normally distributed. To determine whether or not the differences between the means of scores within both groups in pre versus posttests are statistically meaningful, two paired samples t-tests were conducted; the results are depicted in Table 3.

Table 3.

Results of the Paired Samples t-tests for Both Experimental and Control Groups

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	***Std. Deviation***	***Std. Error Mean***	***Lower***	***Upper***	***t***	***Df***	***Sig. (2-tailed)***
Pair 1	**PreRecogEx** **PoRecogEx**	23.900	2.928	0.535	22.806	24.994	44.701	29	.000
Pair 2	**PreRecogCo** **PoRecogCo**	9.800	2.696	0.492	18.481	20.653	19.909	29	.000

The obtained data revealed that there was a significant increase in the scores from experimental group pretest (M = 12.43, SD = 5.348) to experimental group posttest (M = 36.53, SD = 4.188), t (29) = 44.7, p <. 0005 (two-tailed). The mean increase in posttest scores

was 23.9, with a 95% confidence interval ranging from 22.81 to 24.99. The eta squared statistic (0.97) indicated a very large effect size.

Considering the control group, there was also a statistically significant increase in the scores from control group pretest (M = 13.57, SD = 6.038) to control group posttest (M = 23.37, SD = 5.951), t (29) = 19.91, p <. 0005 (two-tailed).The mean increase in posttest scores was 9.8, with a 95% confidence interval ranging from 18.48 to 20.65. The eta squared statistic (.87) indicated a very large effect size.

Then, two independent samples t-tests were conducted to find out whether or not there is any statistically significant difference between the mean scores of the two groups. The t-tests analysis results between the experimental and the control groups' pretests and posttests are presented in Table 4Since in both t-tests, the sig value is above 0.05, only the data regarding equal variances assumed are reported.

Table 4.

Results of the Independent Samples t-tests for Both Experimental and Control Groups

		Levene's test for equality of variances		**t-test for equality of means**		
		F	**sig**	**t**	**df**	**Sig(2-Tailed)**
Voc. Pretests	Equal variances assumed	0.520	0.474	0.770	58	0.445
Voc. Posttests	Equal variances assumed	2.054	0.157	9.760	58	0.000

Accordingly, there was no significant difference in scores of the experimental (M = 12.43, SD = 5.35) and the control groups pretests (M = 13.57, SD = 6.04; t (58) = 0.77, p = 0.45, two-tailed). The magnitude of the differences in the means (mean difference = 1.13, 95% CI: 1.81 to 4.08) was very small (eta squared = 0.01). In contrast, there was a significant difference in scores of the experimental (M = 36.33, SD = 4.19) and the control groups posttests (M = 23.37, SD = 5.95; t (58) = 9.76, p = 0.00, two-tailed). The magnitude of the differences in the means (mean difference = 12.97, 95% CI: 10.31 to 15.63) was very large (eta squared = 0.62).

5. Discussion

Based on analyzing the data shown in tables 1, 2, 3, and 4, it is evident that initially, both groups were not meaningfully different from each other regarding their knowledge of

the target vocabularies. There was a meaningful improvement in both experimental and control groups'performance after receiving the treatment and placebo. However, the experimental group's performance in the posttest was significantly different from that of the control group. According to the analyses of the results carried out in the current study, it can be concluded that the treatment was statistically more effective than the conventional method of teaching vocabulary (i.e., the placebo).

Burston and Athanasiou (2020) considered 2000 MALL studies from 1994 to 2018. They reported that the design inadequacies and blurred inter-communication among learners were apparent. Contrary to the previous studies, in the current study, the learners were provided with interactive facilities such as email correspondence, online chat systems, and forums. Besides, self-assessment tools such as online quizzes were available to guaranty that learners received immediate feedback. They were also provided with delayed feedback from their classmates as well as their teacher. The findings of the current study confirmed the positive impact of using mobile apps. Therefore, it is noticeable that regardless of the differences mentioned above, the outcome of the current study that using a mobile app improves learning English, namely vocabulary,is in line with the findings of the studies mentioned above.

Even though learners'particularities are the fundamental aspect of developing apps, the researcher could not find any mobile application for teaching English vocabulary developed based on the target users'needs analysis. Heil et al. (2016) mentioned that the present mobile apps'environments are not motivating enough; neither are they rooted in the learners'needs analysis, although focusing on the particularities of learners and educational situations, besides enhancing interaction and critical thinking are emphasized in the literature. In contrast with the previous projects, and to cover the pedagogical needs and necessities of a specific academic situation, the researcher used VG, which was custom-made for the target EFL learners of the current study.

In a meta-analysis of 33 eligible primary studies carried out by Lin and Lin (2019), contrary to the current study, no mobile app was developed, and only the conventional messaging systems were used.The findingsof the studies mentioned aboverevealed that using mobile apps provides a positive and significant impact on vocabulary learning, a feature that is in accordance with the findings of the current study.

The findings of this study highlight the importance of interaction among learners and their teachers, a feature that conforms with the findings of the study conducted by Nushi and Eqbali (2017), who stated that peer-to-peer collaboration improves learning. The results of the current research are also in line with the study carried out by Johari et al. (2020), which emphasized the positive impact of "teamwork and cooperation"(P. 1) on learning English vocabulary. Moreover, Liliia and Gulnara (2016) accentuated a mobile app's efficiency in an online cooperative learning situation. Therefore, the present investigation results are in line with the findings of the studies mentioned above regarding the provoking and elevating impact of using a cooperative, online mobile app on learning the English language and its components, though, in their studies, no custom-made mobile app was developed.

6. Conclusion

The findings revealed that regardless of the differences between the design and implementation of this investigation and all of the studies mentioned above, it can be concluded that using a mobile app (VG) to teach the English language and its components, namely vocabulary in the current research, brings about a positive and significantly meaningful impact.In conclusion, self-assessment via interviews or discussions in forums and the consistent feedback analysis invoked new necessities and pushed the system of the current study to get to a new stable situation (i.e., a new attractors basin). This dynamicity and interaction between various elements of app developmentwerehardly considered in the previous studies that were reviewed by the researcher of the current investigation.

Considering the limitations of the current investigation, the researcher could not randomly choose the participants of the study to increase the generalizability of the research findings. Due to the few numbers of male learners in the chosen classes, only female learners were considered in the study, so the variable "gender"was controlled. Besides, only EFL learners whose native tongue wasPersian were studied since learners with different mother tongues were not available. The technology savvinesslevel (i.e., the level of awareness of the modern technology and the ability to use it appropriately) may affect learners'performance, but it was not captured due to the available equipment limitations.

The findings of the current study bring about practical insights for scholars investigating the field of language learning/teaching, especially those involved in vocabulary studies. Moreover, app developers and scholars provoking educational movements can use

the present research findings to design more in-depth investigations. Furthermore, using the developed app of the current study (VG) can help those who are interested in increasing their knowledge of vocabulary recognition for an academic purpose or their objectives.

Finally, since the current study was an attempt to investigate VG's impact on vocabulary recognition, further research is recommended to open new trajectories in the realm of using mobile applications for learning/teaching different facets of vocabulary.

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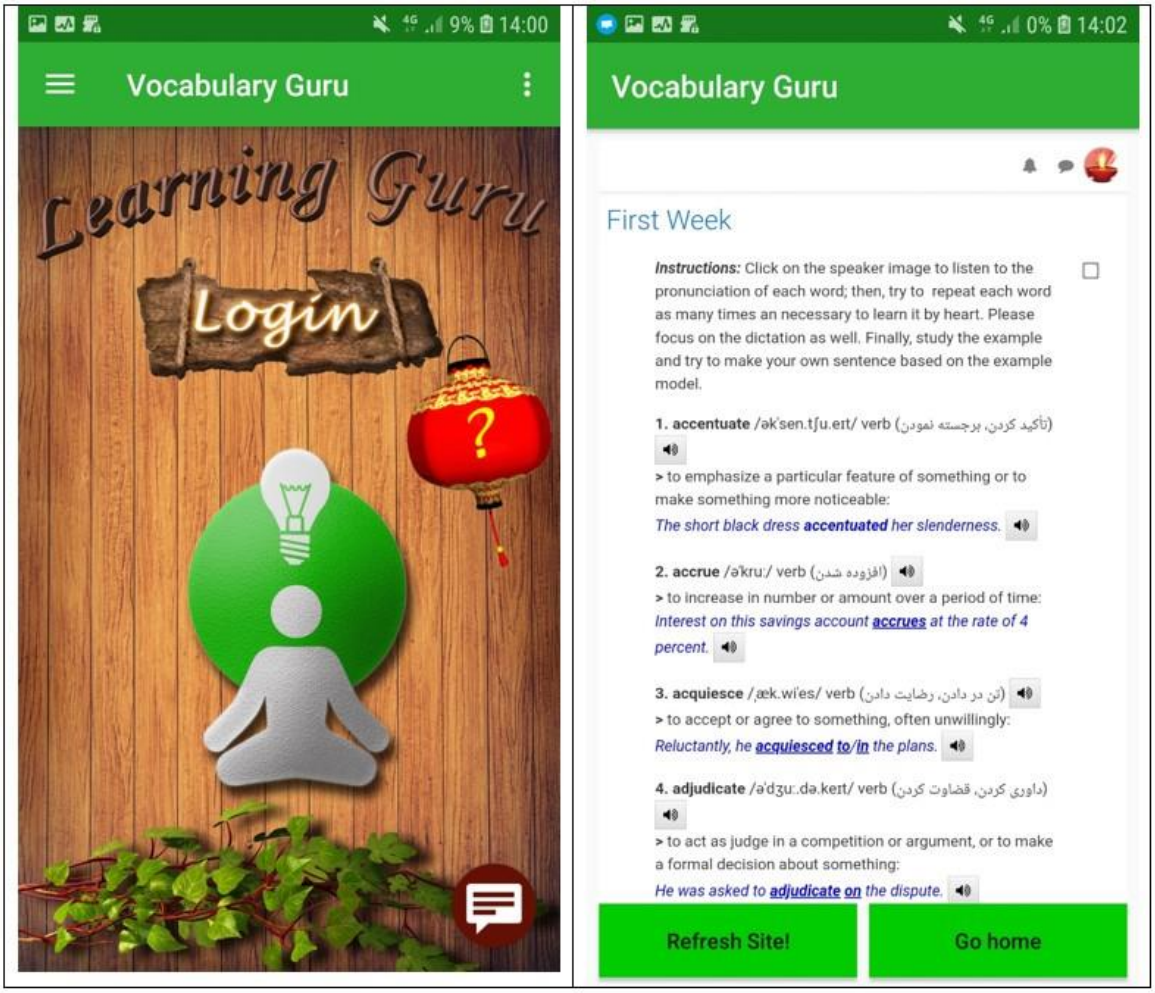
Appendices

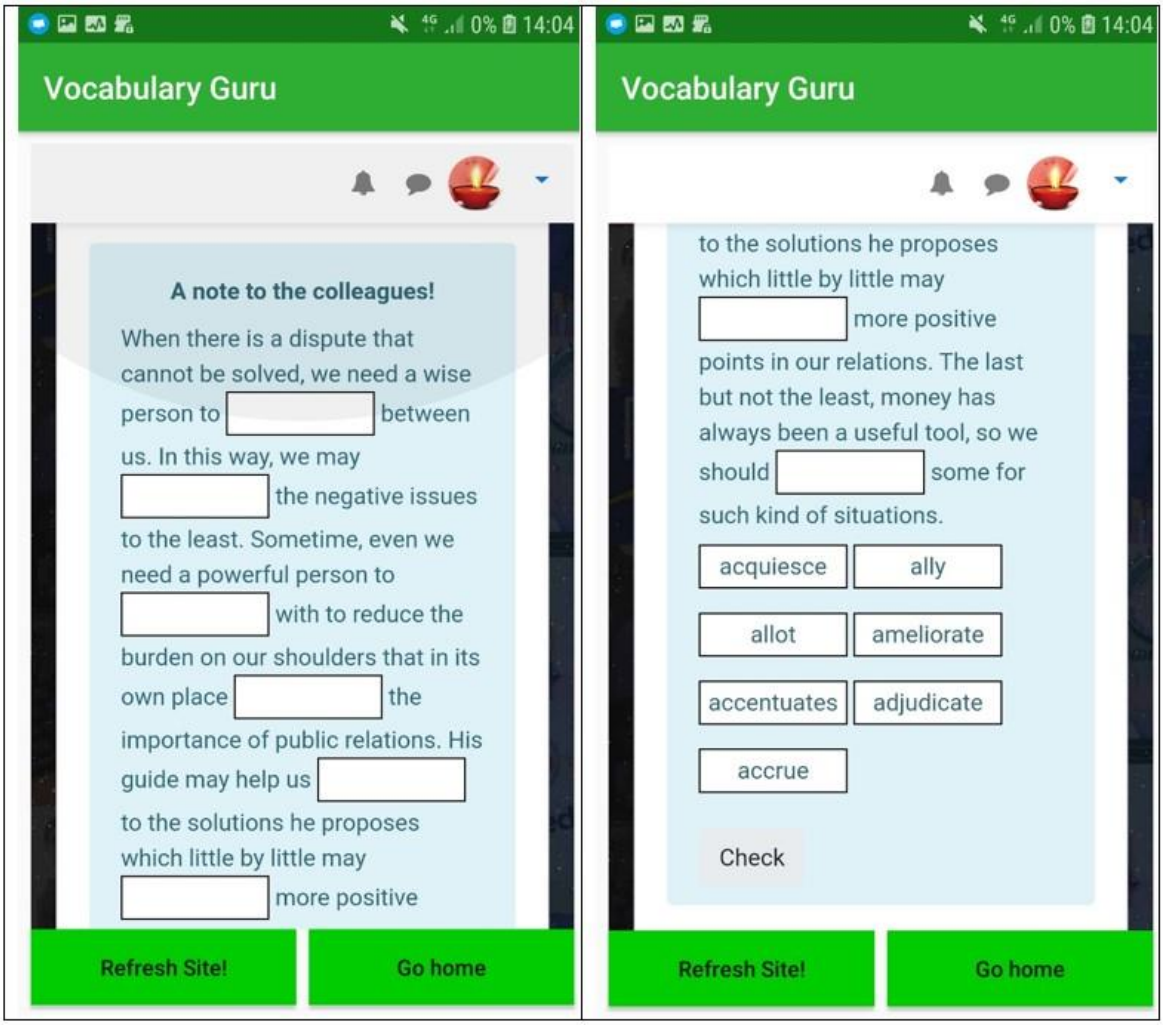
Appendix A

VG Sample Lesson


9% 14:00
Vocabulary Guru
Learning Guru
Login
?
0% 14:02
Vocabulary Guru
First Week
Instructions: Click on the speaker image to listen to the pronunciation of each word; then, try to repeat each word as many times an necessary to learn it by heart. Please focus on the dictation as well. Finally, study the example and try to make your own sentence based on the example model.
1. accentuate /əkˈsen.tʃu.eɪt/ verb (تأکید کردن، برجسته نمودن)
> to emphasize a particular feature of something or to make something more noticeable:
The short black dress accentuated her slenderness.
2. accrue /əˈkruː/ verb (افزوده شدن)
> to increase in number or amount over a period of time:
Interest on this savings account accrues at the rate of 4 percent.
3. acquiesce /ˌæk.wiˈes/ verb (تن در دادن، رضایت دادن)
> to accept or agree to something, often unwillingly:
Reluctantly, he acquiesced to/in the plans.
4. adjudicate /əˈdʒuː.də.keɪt/ verb (داوری کردن، قضاوت کردن)
> to act as judge in a competition or argument, or to make a formal decision about something:
He was asked to adjudicate on the dispute.
Refresh Site!
Go home

Appendix B

VG Sample Drag and Drop Recognition Quiz



Appendix C

VG Sample Online Live Chat