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Mobile Assisted Language Learning in EFL Contexts: Maximizing Vocabulary Acquisition through Messenger Apps

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Abstract

Mobile Assisted Language Learning (MALL) has drawn the attention of researchers worldwide and is gaining more popularity in various educational backgrounds. In this context, the present study is conducted to investigate the effectiveness of MALL in English as a Foreign Language (EFL) settings. The study comprised 90 Moroccan high school students, aged between 15 and 17 years old, divided equally into experimental (N = 45) and control (N = 45) groups. The two groups underwent two treatments, which lasted for two weeks. During the first week, the first experimental group was provided with two vocabulary items via WhatsApp messenger three times a day for seven consecutive days; however, the control group received a printed list of the 14 items at the beginning of the week. In the second week, the groups switched treatments with another set of 14 words. A pretest was used to measure participants' vocabulary knowledge of the target items. Additionally, two immediate posttests were administered at the end of each week to measure the subjects' vocabulary learning during the experiment, while a delayed test was used four weeks after the end of the experiment to assess their vocabulary retention. The pre-and delayed-test results were insignificant since they did not show any difference between the groups, while the immediate post-test scores revealed a significant difference, with the experimental groups outperforming the control groups. In short, this study contributes to the growing body of research on MALL and provides insights for language instructors willing to integrate technology for effective vocabulary learning.

1. INTRODUCTION

The rapid evolution of mobile technology, coupled with its global adoption, has led to the widespread dissemination of mobile devices. Current statistics indicate that mobile phone subscribers worldwide exceed seven billion (Statista, 2023). This pervasiveness is noticed in Morocco, the context of the present study, where statistics reveal that 29 million individuals aged five and above possess smartphones, while internet users are estimated at 30 million, as reported by the National Telecommunications Regulatory Agency (ANRT, 2023). Mobile phones have emerged as one of the most popular digital technologies of the 21st century among teenagers and adults (Katz et al., 2014; Merchant, 2012; Traxler & Vosloo, 2014). This widespread has profoundly impacted various facets of human life, including language learning. Mobile phones have gained more popularity than computers due to their lightweight design and affordability. Furthermore, they include a plethora of characteristics such as texting, phone calls, video calls, video recording, and web browsing. These features have captured the interest of many scholars, motivating them to explore the potential of mobile devices in language

education. Consequently, numerous research projects have been carried out in various regions across the globe (e.g., Alahmadi et al. (2023) in Saudi Arabia, Thornton & Houser (2005) in Japan, Bensalem (2018) in the Arabian Gulf region, Lu (2008) in Taiwan, Başoğlu & Akdemir (2010) in Turkey). Nevertheless, there have been limited studies that pertain to the Moroccan environment.

On the other hand, effective teaching and learning in the 21st century should incorporate new tools and technologies to accommodate students' needs and support their language learning. These learners are part of a global generation known as "digital natives" worldwide (Prensky, 2001, 2005). They are accustomed to technology from a young age, and they utilize a range of digital devices for various reasons, such as surfing the net, chatting, and playing video games. Nowadays, a lot of students have mobile phones which they take with them wherever they go, including to school. These phones function as compact portable computers, although not all educators use them for teaching and learning purposes.

The current research seeks to examine how effective mobile phones are for learning English vocabulary in an EFL setting, using Morocco as a case study where English is taught as a foreign language and where students require further exposure to English beyond the classroom. The primary objective of the current research is to determine whether the use of MALL can serve as an educational tool for English language acquisition in an EFL setting such as Morocco. Additionally, this study seeks to compare the effectiveness of vocabulary learning through mobile chat software such as WhatsApp with the conventional paper-based approach. In this respect, three research questions are addressed here:

1. Does vocabulary acquisition through WhatsApp on a mobile device yield better results compared to the conventional paper-based approach?
2. Is there a difference between vocabulary gains of the experimental and control groups?
3. What are the implications for better pedagogical practices?

The availability of mobile phones, which almost all students carry constantly, can help alleviate the scarcity, if not the absence, of technological tools at schools which are often due to high costs, large class sizes, low student motivation, and insufficient teacher training. First, mobile phones do not require advanced technical expertise, making them easy for teachers and students wherever they are. For instance, learners can save time and effort by using a dictionary app on their devices for quicker word search, compared to the use of traditional paper dictionaries. Furthermore, language components such as vocabulary can be taught using mobile phones (e.g., (Abbasi & Hashemi, 2013; Alahmadi et al., 2023; Cavus & Ibrahim, 2009; Lu, 2008; ŞAHAN et al., 2016; Stockwell, 2007; Thornton & Houser, 2005; Zhang et al., 2011)

Teachers can deliver educational content to students to read outside the classroom by using texting platforms such as WhatsApp. English instruction will no longer be confined to classroom settings in this way, especially since portability is an essential factor of mobile phones. Learners can reinforce classroom lessons, pick up new skills and study new materials anytime and anywhere. Thus, mobile technology can help with better expansion of English vocabulary acquisition outside the classroom through MALL integration in English Language Teaching and Learning (ELT/ELL).

Previous research indicates that mobile learning can provide English language learners with the essential assistance to learn the desired content independently, anywhere and anytime. (Chinnery, 2006; Lu, 2008; Naismith et al., 2004; Norbrook & Scott, 2003; Roschelle et al.,

2004; Thornton & Houser, 2005). Earlier studies have also shown that the cost of SMS was one of the disadvantages of using cell phones. However, this issue has diminished due to technological advancements and the increasing use of messenger apps. For instance, WhatsApp offers and supports both synchronous and asynchronous messages in various formats, including text, images, videos, files, and voice calls, along with other functionalities, and it also leverages internet connection to avoid SMS charges (WhatsApp, 2024).

These functionalities enable educators to share various media formats to cater to different learning styles, which will help enrich learning experiences. Furthermore, WhatsApp's global use among different age categories can ensure familiarity and ease of use, which can minimize technical issues that can sometimes arise when integrating new technologies into learning contexts. Its group chat functionality also allows for peer learning since learners can interact and learn from each other. Teachers can monitor students' participation, track their progress, and provide instant feedback. They can also send timely notifications to help promote a consistent engagement with the target content. Finally, the social nature of the platform can help create an engaging and low-anxiety environment for better language acquisition outcomes.

Previous research has shown that sending learners text messages via SMS at different times during the day can help enhance their vocabulary learning (Thornton & Houser, 2005). Using different time intervals is known as the spacing effect, which suggests learning that takes place following spaced time intervals is more effective than massed learning and ultimately assists in vocabulary retention (Dempster, 1987; Greene, 1989). Combining mobile technology with the spacing effect method positively affects memory retention since words are learned more efficiently than when taught all at once (Dempster, 1987; Greene, 1989; Lu, 2008; Nation & Meara, 2002).

2. LITERATURE REVIEW

Mobile technology has undergone an unprecedented evolution during the twenty-first century. Consequently, a wide range of devices, such as mobile phones, tablets, and handheld gaming consoles, have emerged and proliferated worldwide. These devices share a variety of features in common, such as being portable, digital, typically connected to the internet, having different multimedia capabilities, in addition to facilitating many communication-related tasks (West & Vosloo, 2013). The abundance of mobile devices and their ubiquity use did not go unnoticed by many scholars. They began seeking modern tools that could assist in effective instruction. Their endeavors resulted in the development of m-learning as an approach that leverages the ubiquity of mobile devices to enhance learning experiences and cater for modern learners' diverse needs.

Additionally, there has been a surge of interest in English language learning in many non-English speaking countries. In response to this growing interest, scholars have also endeavored to incorporate mobile devices in language teaching and learning. Their efforts have given rise to a groundbreaking idea in language education universally known as mobile assisted language leaning (MALL). MALL has emerged as an approach that aims at enhancing learning experiences beyond traditional classrooms anytime and anywhere, and which is supported by handheld electronic devices such as cellphones, multimedia players, and palmtop computers (Islam & Hasan, 2020; Kukulska-Hulme et al., 2007; Kukulska-Hulme & Shield, 2008).

As a result, numerous studies on mobile learning have been conducted since the early 2000s to explore the effectiveness of the integration of technology into language education. Based on these research findings, mobile learning is effective since it can overcome limitations of time and location, hence allowing students to engage in language learning activities anytime

and anywhere (Chen & Chung, 2008; Garzón et al., 2023). Moreover, mobile phones offer learners flexibility, cost-effectiveness, small equipment size, and ease of use, enabling them to review material as needed and at their own pace. (Huang et al., 2012). Mobile phones also offer various features such as portability, social interactivity, context sensitivity, connectivity, and individuality (Klopfer et al., 2002). These features make mobile phones a useful instructional tool for 21st-century learners.

Similar to the current research, most studies on MALL have primarily focused on vocabulary teaching and learning. On the other hand, vocabulary plays a pivotal role in second/foreign language learning as it is seen as an "essential building block of language" (Schmitt et al., 2001). Furthermore, vocabulary is prioritized over grammar since students who lack sufficient grammar may be unable to express themselves accurately, while learners with insufficient vocabulary knowledge are likely to encounter serious communication and comprehension issues. Scholars like Wilkins (1972) have stressed the critical role of vocabulary, stating that, "without grammar very little can be conveyed, without vocabulary, nothing can be conveyed" (Wilkins, 1972). For this reason, vocabulary instruction has received more attention in EFL contexts as it is considered essential to teaching both receptive and productive skills, and MALL seems to be an effective approach to vocabulary learning and teaching.

In this regard, researchers have conducted several studies to examine the effectiveness of cell phones as a tool for English vocabulary learning (Lu, 2008; Thornton & Houser, 2005). Thornton and Houser (2005), for instance, carried out a study in which they emailed vocabulary lessons via mobile phones to students. The researchers wanted to determine if mobile learning helped promote language learning for Japanese university students. They believed that learning on the move (LOTM) with the help of a push learning technique at three-spaced time intervals would help students retain vocabulary items better. The results showed that students in the experimental group had more vocabulary gains than students in the control group. The researchers concluded that the mobile phone could be an effective tool for language learning.

Similarly, Lu (2008) carried out a study in a Taiwanese vocational school to investigate the effectiveness of incorporating mobile phone SMS as a tool for English vocabulary learning. The findings showed that mobile phones not only facilitated learning for the experimental group, but they also motivated the students to learn beyond the classroom and who could achieve higher scores than the control group. Another similar study includes Zhang et al.'s (2011) quasi-experiment in China. The tests' results showed that the experimental group outperformed the control (paper-based) group. The findings also showed that short-term spaced vocabulary learning could be better than massed vocabulary learning.

Other studies that used other messaging platforms, such as WhatsApp, include Şahan et al.'s (2016) experiment, which sought to investigate the impact of WhatsApp on language learning. The achievement tests' results indicated that the participants' language proficiency improved, which meant that the integration of the platform had a positive effect on learners. For instance, 15 out of 33 participants got the maximum score of 100 with a mean score of 87.10. Similar to this experiment is Amry's (2014) study at Taibah University in Saudi Arabia. This study provides further evidence of the effectiveness of MALL through the use of WhatsApp in language teaching and learning. Once again, the test results, which were administered at the end of the experiment, showed that the experimental group outperformed the control group, which participated in face-to-face activities in the classroom.

Other research that echoes the results of the aforementioned experiments includes Alahmadi et al.'s (2023) recent study in KSA, where the researchers wanted to explore the use of WhatsApp in learning English vocabulary inside and outside the classroom among 44 native

Arabic undergraduate students. The findings of the study showed that the use of WhatsApp outside the classroom significantly improved vocabulary learning while there was no significant effect on vocabulary learning when the app was used inside the classroom. This study also underscored the importance of both the learning environment and learners' motivation when integrating MALL tools. Irawati (2024) examined the effect of WhatsApp Messenger on vocabulary learning among EFL learners in Indonesia. In this study, which lasted for 25 days, the experimental group used collaborative vocabulary learning via WhatsApp while the control group used a non-collaborative learning method to learn 75 items. Results from pre- and post-tests showed that the experimental group had significantly greater improvement in vocabulary retention compared to the control group. As can be seen, all these previous studies show that WhatsApp Messenger can be a valuable and effective tool for enhancing English vocabulary learning.

3. METHODOLOGY

3.1. Participants

The experiment was carried out in a Moroccan high school. Ninety 10th grade students, who are native Arabic speakers, passed a VKS (Vocabulary Knowledge Scale) pre-test to participate in the study. The participants included 37 male students (41,11%) and 53 female students (58,88%) aged between 15 and 17 years old who owned mobile phones, which they agreed to use during the experiment. Informed consent forms, in Arabic, were given to students and their parents to read and sign before participating. The students were randomly divided and assigned to two groups, each containing 45 participants: an experimental group, referred to as the mobile phone group (M1), and a control group, referred to as the paper group (P1).

3.2. Materials

3.2.1. Target words (TWs)

In this study, 28 vocabulary items were selected based on the participants' responses in the 50-word vocabulary knowledge scale (VKS) test. These selected words were the ones which the participants could not identify during the test. The 28 words covered various parts of speech and each word included its pronunciation, part of speech, definition and example sentences.

3.2.2. Tests

Four tests were administered: a pre-test, post-test 1, post-test 2 and a delayed test. Five EFL teachers reviewed and validated the tests as being suitable for the subjects. In order to ensure reliability, the tests were administered in person with the assistance of two teachers.

3.3. Procedures

A VKS test was administered to 105 students to determine participants' knowledge of the target words. The test included 50 vocabulary items with five levels (A, B, C, D, and E) following Paribakht and Wesche's scoring categories and their interpretations (Wesche & Paribakht, 1996). The emphasis was placed on categories E and D since checking A, B, or C indicated that the participants did not understand the meaning of the items. Students received one point for providing either a synonym or a translation and another point for using the words in sentences. The final selection of vocabulary items was based on participants' inability to define and/or use them in sentences accurately. The M1 group received 14 items during the first week. This group members received two words daily via WhatsApp on their phones for seven days in a row. Messages were sent at three different times during the day. Prior to the experiment, the subjects' phone numbers were collected, and the messages' delivery times were clearly explained to them. The participants repeated the same procedure when they switched roles in the second week.

The subjects were sent the first message at 8:00 am, which is usually their commuting time from home to school (Lu, 2008; Thornton & Houser, 2005). They were sent the second message was sent at 1:30 pm, which is typically lunchtime, while the third message was delivered at 7:30 pm when subjects would usually be at home. The paper-based group (P1), on the other hand, was given a printed list of all the target words along with their parts of speech, definitions and sample sentences on the first day of the week. They were also told to study the fourteen words in a self-regulated manner and within the same time frame as the experimental group.

The subjects in both groups took an immediate post-test at the end of every week related to the sets of words they had studied previously. The tests' results were used to compare the participants' performance according to the instruments they used. Four weeks later, a final delayed post-test covering all 28 words was administered without notifying the subjects. The rationale behind this was to determine to what extent participants could recall vocabulary they had studied before without further preparation.

3.4.Data Analysis

Following data collection, statistical analysis was performed using SPSS (version 26). Some tests were performed to ensure the robustness and accuracy of the findings. First, the Kolmogorov-Smirnov and Shapiro-Wilk test was conducted to examine the normality of the distribution of the tests' scores. The p-value greater than .05 indicated a normal distribution ($p>.05$) (posttest 1, 2 and delayed test). However, the p value of the pretest was smaller ($p<.05$). As shown in Table 1, both the experimental and the control groups had a p value which was greater than .05 in posttest 1, 2 and delayed test except in the pretest where the experimental group had a p value of .000 in both the Kolmogorov-Smirnov and Shapiro-Wilk test, and the control group had a p value of .001 in the Kolmogorov-Smirnov test and .005 in the Shapiro-Wilk test. To address the research questions, the appropriate statistical methods, independent samples t-test and Mann-Whitney U test, were used for the analysis of quantitative data. Descriptive statistics, including the mean and standard deviation, were also calculated to interpret the collected data thoroughly.

Table 1: Normality test of the experimental and control groups' pretest, posttest 1, posttest 2, delayed test scores

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Test	Groups	Statistic	df	Sig.	Statistic	df	Sig.
Pretest	Experimental	,223	45	,000	,864	45	,000
	Control	,176	45	,001	,923	45	,005
Posttest 1	Experimental	,110	45	,200*	,961	45	,131
	Control	,097	45	,200*	,967	45	,221
Posttest 2	Experimental	,100	45	,200*	,958	45	,103
	Control	,124	45	,080	,966	45	,202
Delayed test	Experimental	,099	45	,200*	,962	45	,147
	Control	,115	45	,170	,967	45	,229

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

4. RESULTS

Tables 2 and 3 show the descriptive statistics of the participants' performance in the experimental and control groups, including pre- and post-test 1, 2, and delayed test scores across two weeks. The results in Table 2 revealed no significant difference in the mean scores on the pretest of the experimental group (M1) (M= 5.31 SD= 3.60) and the control group (P1)

(M= 5.60 SD= 3.74), indicating homogeneity of baseline vocabulary level. A Mann-Whitney U test was also used to confirm these findings. As shown in Table 4, the results did not reveal any significant difference between the two groups on the pretest (U= 985,500, p= .827). In addition, the similarity in the mean and sum of ranks together with the non-significant p-value underscore the study's internal validity, making it more likely that any subsequent observed intervention differences may be attributed to the treatment rather than to pre-existing group disparities.

Table 2: The descriptive statistics of pre, posttest 1 and posttest 2 results of the participants

Week 1					Week 2			
Test	Groups	N	Mean	Std. Deviation	Test	Groups	Mean	Std. Deviation
pretest	Experimental	45	5,31	3,60	pretest	Experimental	5,60	3,74
	Control	45	5,60	3,74		Control	5,31	3,60
Posttest1	Experimental	45	15,55	2,60	Posttest2	Experimental	15,40	3,20
	Control	45	13,02	4,15		Control	13,61	3,12

Table 3: The descriptive statistics of the delayed test results of the participants

	Groups	N	Mean	Std. Deviation	Std. Error Mean
Delayed test	Experimental	45	13,72	3,73	,556
	Control	45	13,86	3,36	,502
Posttest 2	Experimental	45	15,40	3,20	,478
	Control	45	13,61	3,12	,465

Table 4: Mann-Whitney U Test results for pretest scores of the experimental and control groups

	group	N	Mean Rank	Sum of Ranks
score	1	45	44,90	2020,50
	2	45	46,10	2074,50
	Total	90		

Test Statistics[a]

	Value
Mann-Whitney U	985,500
Wilcoxon W	2020,500
Z	-,219
Asymp. Sig. (2-tailed)	,827

a. Grouping Variable: group

The results of the immediate posttests scores during the two weeks show that both the experimental and the control groups made significant progress in learning the target words compared to the pretest mean scores regardless of the medium of vocabulary delivery. The results of the immediate posttest in the first week show that the experimental group (M = 15.55, SD = 2.60) achieved a significantly higher mean score than the control group (M = 13.02, SD = 4.15). In the second week, the roles of the two groups were reversed; that is, M1 became P2, and P1 became M2. The results of posttest 2 show that the experimental group (M2) (M = 15.40, SD = 3.20) outperformed the control group (P2) again (M = 13.61, SD = 13.12). The descriptive statistics of the delayed test scores, shown in Table 3, reveal that the experimental group (M = 13.72, SD = 3.73) and the control group (M = 13.86, SD = 3.36) had relatively similar means and standard deviations, which are not statistically significant.

While these findings show that the intervention had an immediate positive impact on the experimental group, they suggest that the intervention's long-term impact on vocabulary retention may be the same for both groups. These descriptive results provide preliminary evidence of the intervention's effectiveness, offering a solid foundation for further research and development. To strengthen this conclusion, independent samples t-tests were conducted to further analyze the scores for statistical differences and which may help provide a comprehensive picture of the learning outcomes in both the experimental and control groups.

Table 5: Independent Samples t-test on posttest 1 of the experimental and control groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	13,722	,000	3,465	88	,001	2,533	,731	1,080	3,986
Equal variances not assumed			3,465	74,069	,001	2,533	,731	1,076	3,989

The findings of an independent samples t-test, comparing posttest 1 scores of the experimental and control groups in the first week, are presented in Table 5. The result of Levene's test shows that the variances of the two groups were not equal (F = 13.722, p = .000). However, the t-test revealed a significant difference between the two groups (t = 3.465, df = 88, p = .001), indicating that the experimental group had a significantly higher score than the control group. The mean difference of 2.533 combined with a 95% confidence interval of 1.080 to 3.986 shows that the intervention had a significant positive impact on the experimental group compared to the control group.

Table 6: Independent Samples t-test on posttest 2 of the experimental and control groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	,161	,689	2,679	88	,009	1,788	,667	,461	3,115
Equal variances not assumed			2,679	87,936	,009	1,788	,667	,461	3,115

Table 6 shows the results of a second independent samples t-test to compare the scores of the experimental and control groups in the second week, indicating a sustained impact of the intervention. Levene's test results confirm equal variances between the two groups (p = .689), which validates the t-test assumption. Furthermore, the significant difference between the groups (t = 2.679, df = 88, p = .009) shows again that the experimental group outperformed the control group on posttest 2 with a mean difference of 1.788 and a 95% confidence interval which ranged from 0.461 to 3.115. These findings provide strong evidence of a significant positive impact of the intervention on the experimental groups, reinforcing the effectiveness of the treatment and suggesting potential long-term benefits.

Table 7: Independent Samples t-test on delayed test of the experimental and control groups

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	,606	,438	-,193	88	,848	-,1444	,749	-1,633	1,344
Equal variances not assumed			-,193	87,091	,848	-,1444	,749	-1,633	1,345

Table 7 presents the results of an independent samples t-test comparing the experimental and control groups' delayed test scores to determine whether the intervention had a long-term effect on vocabulary retention. The participants were not informed of the last test, which they took four weeks after the end of the study. However, the results showed that MALL's effect on long-term vocabulary retention may be limited. Levene's test indicated equal group variances (p = .438). Nevertheless, the t-test revealed no significant difference between the groups (t = -0.193, df = 88, p = .848). This implies that the impact of the mobile phone

intervention did not persist over time and did not influence the long-term retention of the target words.

5. DISCUSSION

The primary goal of the present study was to investigate the potential of MALL, particularly WhatsApp, in enhancing vocabulary learning among Moroccan EFL learners. The findings of the initial pretest scores showed no significant difference between the experimental and control groups. However, the results of the descriptive statistics and independent samples t-tests scores of posttests 1 and 2 revealed that, regardless of the medium of delivery, the two groups made significant improvements in their vocabulary learning. The comparison of the mean scores indicated that the experimental groups (M1 and M2) outperformed the control groups (P1 and P2) in both posttests 1 and 2, evoking a sense of wonder about the potential of MALL. Therefore, the study showed that implementing m-learning through the integration of WhatsApp positively enhanced Moroccan EFL learners' English vocabulary acquisition. However, the advantage of MALL over the paper-based method was not sustained in the delayed test as the results reflected no significant difference in the mean scores of the experimental and control groups.

These findings are congruent with the growing body of research on MALL, which highlights the potential of mobile technologies in English language learning (e.g., Alahmadi et al., 2023; Amry, 2014; Cavus & Ibrahim, 2009; Irawati, 2024; Lu, 2008; ŞAHAN et al., 2016; Thornton & Houser, 2005; Zhang et al., 2011). The tests scores of all these studies showed that the experimental groups outperformed the control groups. These same studies have reported the positive effect of using MALL to improve participants' vocabulary learning gains, which is echoed in the present study. The effectiveness of MALL, then, can be attributed to several factors when compared to other conventional teaching methods. First, the rich multimedia content delivered to learners via portable devices captures their attention and interest, aiding in acquiring and retaining new vocabulary items, as Thornton and Houser (2005) suggested. Furthermore, research by Lu (2008) indicates that spaced learning, a method that involves repeated exposure to learning material with breaks in between, via mobile phones is more effective than massed learning via paper-based materials, as was observed in the current study.

Moreover, the portability, flexibility, easy access, and convenience that mobile phones offer students empower them to have frequent exposure and practice outside classroom settings, thereby facilitating vocabulary acquisition. Finally, previous research done by Zhang et al. (2011) also shows the ephemeral nature of English vocabulary retention. This suggests that learned vocabulary items may not be stored in long-term memory, potentially due to insufficient repeated exposure. This result also aligns with Lu (2008), who found that the superiority of mobile phone lessons diminished over time, which was reflected in the delayed test scores. The lack of more practice led to a decrease in cognitive involvement load (Hulstijn & Laufer, 2001), which is necessary for deep processing and long-term retention of newly learned vocabulary items. This limitation could explain why the delayed test in the current study yielded no significant results regardless of the use of technology. In this regard, engagement and motivation over time may play a role in influencing the effectiveness of MALL, so exploring ways and strategies to sustain these factors may contribute to better long-term vocabulary retention.

6. IMPLICATIONS OF THE STUDY

The current study's findings provide valuable insight into the potential of MALL tools, particularly the WhatsApp messenger app, in improving vocabulary acquisition among EFL learners. Based on these findings, which echo previous ones, some pedagogical implications can be drawn to help enhance teaching practices in similar contexts. First, the integration of messenger apps like WhatsApp can be a beneficial practice, as demonstrated in the present

study, where the experimental groups outperformed the control groups and achieved better vocabulary gains. In this regard, EFL teachers should consider incorporating activities which leverage messenger apps so that they can deliver rich multimedia content and facilitate better learning experiences.

Furthermore, spaced learning has been proven in this study to be more effective than massed learning provided there is frequent exposure to vocabulary items via mobile devices over time. That is why language teachers should consider implementing spaced learning techniques in their mobile-based activities, which can enhance retention. In addition, the flexibility and portability of mobile devices allow learners to engage with learning materials outside classroom settings, anytime and anywhere, which can encourage self-directed learning. EFL teachers can coach and guide learners on how to effectively use mobile-based content for self-study. Helping learners develop a habit of frequent practice can likely lead to sustained vocabulary gains. Language teachers can also create microlearning opportunities through gamified mobile-based activities and contextualized content via short videos, which will help learners collaborate and interact with each other.

Last but not least, the results of the delayed test showed no significant difference between the experimental and control groups which suggests the need for strategies to ensure sustained vocabulary retention on the long run. Educators should explore further options to maintain learners' interest and motivation, which may help optimize language learning. Based on the same results of the delayed test, it is likely that a blended approach that combines MALL and conventional teaching can help reinforce language acquisition in general and vocabulary learning in particular. These ideas together with professional development training can help EFL teachers harness the potential of MALL and lead to a more creative, impactful and engaging language instruction.

7. CONCLUSION

The proliferation of mobile phones has extended their use beyond mere communication and entertainment to encompass education as well. Their widespread presence among students, together with their use for learning purposes, is becoming increasingly noticeable. Mobile phones' portability, relative affordability, and user-friendliness position them as a potentially effective tool for mobile learning in general and language learning in particular.

The main thrust of this paper has been to explore the impact of MALL, specifically using WhatsApp to deliver English vocabulary lessons to EFL learners. The study compared the use of WhatsApp text messages to printed materials to learn a set of English vocabulary items. The results of posttests 1 and 2 scores revealed that MALL-based instruction had a positive impact on the experimental groups, which achieved higher vocabulary gains than the control groups. Although the results of the delayed test did not yield statistical significance, the findings indicate that MALL can be effective for immediate short-term vocabulary retention. Overall, Mobile Assisted Language Learning emerges as a promising approach that can significantly contribute to the enhancement of English language instruction.

8. LIMITATIONS

The findings of the current study provide valuable insight into MALL practices. It showed that the integration of MALL tools can improve learners' vocabulary gains. However, like many studies, the current study's design is subject to limitations in that its results cannot be generalized; yet, it is hoped that it will contribute to the field of MALL in EFL settings. First, the study focused on a short list of general vocabulary. Therefore, incorporating collocations, idioms, or a longer vocabulary list might have led to different results. Second, the current study's findings are specific to a particular context. It took place in an urban area in a Moroccan context, and the results may not be applicable in other educational contexts. Thus,

further research should be conducted in different regions to see whether similar results and benefits can be observed in those contexts. Lastly, the study focused exclusively on the WhatsApp platform to deliver lesson messages to learners. Other similar platforms, which may offer other functionalities such as adaptive learning and gamification, can be explored to find out whether they offer compelling learning experiences, leading to better and sustained learning gains.

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