



## Mobile Phone Apps: An Emerging E-Platform for Vocabulary Learning and Retention

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### Abstract

Emerging mobile technology appears to have promising attributes that can extend students learning opportunities beyond classroom environments. The purpose of this study was to investigate the impact of using mobile phones on Grade 11 students' vocabulary learning, and retention. The sample of the study consisted of 46 students selected randomly from two Post Basic education schools in Dhofar, Sultanate of Oman. The experimental class included 22 students and the control group had 24 students. The control group received the vocabulary exercises, and relevant feedback in printed-based format, while the experimental group received both the vocabulary exercises and feedback via the mobile application (Ko-Su). A vocabulary test (pre-test, immediate post-test, delayed post-test) were used to collect data needed to answer the research questions. The results indicated that there was no significant difference in vocabulary achievement between students who learned vocabulary through mobile phones and students who learned vocabulary in the conventional way. However, the experimental group outperformed the control group in the delayed post-test. Based on the findings of this study it can be argued that mobile phones can provide effective platforms for extending the students' learning landscape. The researchers suggest that further studies in this area should consider more demographic and contextual variables in relation to various attributes of Apps and mobile devices.

**Key words:** Mobile phones, Mobile learning, Ko-So App, Vocabulary learning, Vocabulary retention, Oman, Basic education.

### INTRODUCTION

Mobile devices such as smart phones and tablets are widely used today and are available for a large number of students in Post Basic Schools. Gardner and Davis (2013) have characterized the young people of today as "The App Generation." Generally, these devices and applications are used for texting, browsing, playing games and socializing. Moreover, mobile academic related applications and programs can enhance learning greatly. In response to the advent of technology and fast growing use of

Mobile worldwide "Oman is going totally mobile and it now has 1,625,426 more mobile subscriptions than the number of people in Oman, according to the latest statistics from the Telecom Regulatory Authority (TRA)" (Das, 2014). For instance, the total number of mobile subscribers was 5,617,426, of the population of Oman 3,992,000 (Das, 2014). From a technological point of view, mobile devices are becoming more capable of performing different functions in learning designs. A significant amount of literature defines mobile learning as "a derivation or extension of e-learning, which is performed using mobile devices such as PDA, mobile phones, laptops, etc." (Şad & Göktaş, 2013, p. 3).

Researchers have investigated many ways to integrate mobile devices into education. Similar to learners of many other subjects, students of foreign languages may greatly benefit from the use of mobile learning technology. Mobile learning can provide new opportunities to follow educational materials, overcoming many restrictions about times and places most suitable for learner access (Romero, Zarraonandia, Aedo & Díaz, 2010). More specifically, Mobile assisted language learning (MALL) first appeared in the field of English Language Teaching (ELT) in 2009 with the emergence of mobile applications for language learning brought up by the British Council. Soon after that, several major ELT publishers produced apps related to course books (Dudeny & Hockly 2012). According to Lan, Sung and Chang (2007), with comparison to Computer Assisted Language Learning (CALL), mobile assisted language learning (MALL) has the capability of providing EFL learners with the same chances for independent and targeted practice and the immediate/spontaneous corrective feedback. Wu, Chen, Kao, Lin and Huang (2012) note that 86% of the 164 mobile learning studies show positive results. As several others in ELT, Romero, Zarraonandia, Aedo and Díaz (2010) emphasize the importance of mobile learning in English language teaching (ELT), specifically in foreign language learning. They point out that the effectiveness of foreign language learning could be greatly enhanced by the application of mobile learning techniques. They believe that the use of mobile learning in this domain seems particularly appropriate because it can be aimed at different skills and focus on activities related to this type of learning. This will allow students many chances to practice what they have learned outside the classroom. Thus, mobile learning can serve the four different proficiency skills of English and can adopt different forms of activities.

Vocabulary knowledge is considered one of the requirements for successful communication (Nation, 2001). One of the symptoms of poor vocabulary learning and teaching according to Wallace (1982) is the inability to retrieve vocabulary that has been taught. This occurs when the student has been exposed to a word at some stage of learning, but the word cannot be brought to mind when the learner needs it. Thus researchers have been searching for ways to enhance students' acquisition and retention of new vocabulary. While there is seems to be an agreement among researchers on the fact that second language learners are faced with the challenging task of remembering many new words, the issue of how exactly learners can best accomplish this task is greatly undecided. Yet determining what strategies help in the retention of vocabulary is important to the task of building vocabulary. It is believed

that frequency lead to better retention. Frequent exposure and repetition are needed so that a vocabulary item can become part of the student's productive vocabulary (Wallace, 1982). However, many students are exposed to the target language only in the classroom setting and for a limited number of hours a week. Moreover, it is difficult for these students to use English outside the classroom in countries where English is a foreign language (EFL).

### **STATEMENT OF THE PROBLEM**

Research has shown that vocabulary knowledge is essential for any language proficiency. Apparently, it is the basic of any language learning skill. A number of studies were conducted in Oman to assess the students' vocabulary knowledge and determine proper ways to enhance their English language proficiency. As stated in the Drive for Quality report (2012) "grade 12 graduates lack skills, particularly in English proficiency"(p. 32). Similarly, Al Hosni (2014) found out that Omani students struggle to find the appropriate vocabulary items when trying to speak in English, which reflects their insufficient vocabulary repertoire. In Al Mahrooqi's study (2012) all participants without exception mentioned vocabulary as the biggest hindrance to their reading comprehension and involvement. Moreover, in Al Seyabi and Tuzlukova's study (2014) Omani students identified choosing the right vocabulary to express their ideas as one of their problems in writing. Omani students comment that "...there are no opportunities to practice English outside the classroom (Al-Mahrooqi, 2012, p. 267)." Similar to other EFL learners, in Omani schools, students are exposed to the target language only in a classroom setting and for a limited number of hours per week. They are exposed to a relatively large amount of vocabulary, but it is questionable if they can retain and uses all the words.

Many studies have examined the effect of mobile learning on students' vocabulary retention. Mobile learning has been found to enhance the learning and retention of L2 vocabulary. This is due to the features of mobile devices that can allow learners to easily access learning materials at any time and place, overcoming many problems such as the limited language practice and the lack of language exposure. Besides delivering the content, many mobile applications today have the advantage of providing the learners with the possibility of accessing multimedia information and interacting with their instructors, as well as getting immediate feedback. Using mobile phones as a platform for learning has been shown to affect students' attitudes and motivation. This has led to the emergence of the need to study the issue in the Omani context. Therefore, this study aims to explore the effectiveness of mobile learning in promoting Omani students' vocabulary learning and retention. Its significance springs from the literature emphasis on the using technology in providing EFL students with resources and exercises to access practice and use the English language accurately and make use of their time effectively, which can solve some students' problems regarding vocabulary learning. Secondly, there is a huge movement directed by the government to have 'a digital Oman' which focuses on using technology to support lifelong learning for all, to create independent learners, promote student-centered learning as well as reduce money

spent on education (Vision of Oman, 2014). Therefore, this study provides evidence for the impact of emerging mobile technology on English language learning. Third, the study provides useful materials and procedures for other studies of a similar context. Fourth, although mobile learning is highly thought of as useful in language learning, there is little empirical evidence (especially in the Omani context) to show its effectiveness in learning and retaining vocabulary for EFL students. This study aims to help fill in the gap in relevant literature by examining the effects of using mobile devices on improving the learning of vocabulary by Omani students. It also seeks to identify students' attitudes towards using mobile devices in learning in general, in learning vocabulary and learning through Ko-Su app.

## RESEARCH QUESTIONS

This study seeks to answer these questions:

1. Is there a significant difference in vocabulary achievement between students who learn vocabulary through mobile phones and students who learn vocabulary in the conventional way?
2. Is there a significant difference in vocabulary retention between students who learn vocabulary through mobile phones and students who learn vocabulary in the conventional way?

## LITERATURE REVIEW

Learning new vocabulary is an integral part of learning a new language. Moras and Carlos (2001) state "Nowadays it is widely accepted that vocabulary teaching should be part of the syllabus, and taught in a well-planned and regular basis" (p.1). Some researchers have estimated that in order to understand nontechnical English texts, learners should know at least 5,000 lexical items (Laufer, 1998; Nation, 2006). Nation (2006) claims that the base line of learning L2 words is 2,000 word families, and if the learner wishes to read newspapers or novels, the learner must know 8,000 to 9,000 word families. Vocabulary learning has been divided into incidental and intentional learning. Intentional vocabulary learning occurs when students work on activities that have the aim of retaining target vocabulary while incidental vocabulary acquisition takes place, unintentionally, as a by-product of other activities, such as reading or listening (Hulstijn, 2001). Often, incidental learning occurs without awareness of being tested on retaining the target vocabulary. In intentional learning, the student is informed of the coming test and so there is a conscious focus on remembering the words (Hulstijn, 2001).

Direct, intentional instruction of vocabulary has been shown to be useful and many believe that focusing the students' attention directly on the target words, as done in intentional learning, gives the best opportunity for its retention (Laufer, 1998; Schmitt, 2000). Nation (2001) states that intentional and deliberate approaches to learning vocabulary result in better retention within a specific time frame than incidental learning does. Since these approaches are time-consuming, students should be able to

learn words incidentally as well (Schmitt, 2000). According to Nation (1995), form focused vocabulary learning has four main values. It speeds up vocabulary learning, allows large amounts of vocabulary to be available in explicit knowledge for meaning focused use, thus entering implicit knowledge and raises awareness of the systematic features of vocabulary. This awareness will make the words more likely to be noticed and thus more likely to be acquired. It may contribute directly to implicit knowledge. The great value of form focused vocabulary learning is that it allows a store of knowledge to be available for such use and hopefully will add to the development of implicit knowledge. Nation (1995) emphasizes that vocabulary instruction should involve thoughtful processing so that learners can remember the words. Moreover, drawing attention to the systematic features of vocabulary is needed. Thus, attention should be given to affixes, the underlying meaning of words, and the way they collocate with other words. Vocabulary instruction should allow for many opportunities to enter implicit knowledge. It is therefore important to make sure that words that are learned are used at opportune times. Learners' ability in memorizing both social and academic vocabularies in any situation is important. In this regard, finding an effective vocabulary instruction method is critical. Experiments in deliberate learning have shown that learning rates and long-term retention rates far exceed those of incidental learning (Nation 2001). Incidental vocabulary learning with direct vocabulary learning shows that direct learning is more effective. This is because more attention is given to language learning, which makes learning more effective (Schmitt, 2000).

Memory refers to the mental processes of retaining information for later use and retrieval (R. Loftus & F. Loftus as cited in Liu, 2011). Atkinson and Shiffrin (1968 as cited in Khazaie & Ketabi, 2011) proposed a systematic and comprehensive information processing model which includes a three-scale processing model of memory: sensory memory, short-term memory, and long-term memory. The process of information entering into the short-term memory is called 'working memory.' Although forgetting could happen at any stage of memory, there are many ways to facilitate the memorization of knowledge such as repetition, retrieval, elaboration and coding. The nature of vocabulary knowledge is complex. Learning the meaning of a new word, for example, does not mean that retention of that knowledge is preserved. Indeed, if new words are not repeated within a certain time frame, they will be forgotten and the next time they are encountered, it will be as if it were for the first time (Henriksen, 1999). Each time a word is encountered in a new context, if it is recognized, the depth of knowledge of the word is increased. In addition, the depth of knowledge a learner has of a word will grow as the learning progresses (Laufer, 1998). Thus, rationally increasing vocabulary breadth is an important step and that depth will be developed as the learning process continues. An essential step in learning a new word is noticing it (Nation, 2001; Laufer & Hulstijn, 2001). Noticing occurs when the student pays deliberate attention to a word, its form and its meaning. The more amount of attention given to the new word, the better the chances of retaining it (Laufer & Hulstijn, 2001).

Using different teaching methods is necessary to accommodate the diversity of learner needs and to facilitate learners' lexical retention. To retain a word, a learner needs to

transfer it from the short-term memory, where it can be retained temporarily, to the long-term memory, where it can be stored permanently. The failure of this transfer leads to forgetting this word (Henriksen, 1999). Many researchers have discussed the optimal conditions for vocabulary acquisition, most of which have common features. Whether vocabulary learning is incidental or intentional, explicit or implicit, there is a consensus among researchers on certain principles that apply to all learning of lexical knowledge. Pickrell (2010) and Thornbury (2002) have specifically proposed some techniques for vocabulary retention. Some of these techniques are repetition, motivation, practicing and recycling. Here, repetition is defined as the repeated rehearsal of the material. Researchers emphasized that important repetition is not rote learning, but rather a repetition of encounters with a word since words stand a good chance of being remembered if they have been encountered at least seven times over spaced intervals. Motivation refers to the students' wanting to learn new words and spend more time on rehearsal and practice, which in the end will pay off in terms of memory retention. By practicing context, the researchers meant practicing using words in the context so that the students learn how to use the words correctly. Recycling refers to doing the tests or exercises in which the students can encounter the learned words in a different way from the time they first encountered them, rather than in their original contexts. The tests or exercises can include matching definitions and filling in the blanks.

It is necessary to have repeated exposure to new words. Many researchers accept the usefulness of explicit teaching of vocabulary or reading, plus vocabulary enhancement activities, and do not believe in the efficiency of the context method only (Coady, 1997). Repetition is essential for vocabulary learning. Because there is so much to know about a word, a single encounter with it will not be sufficient for learners to grasp all the necessary information, let alone that vocabulary items must not only be known - they must be known well so that they can be fluently accessed. Repetition thus adds to the quality of knowledge and also to the quantity or strength of this knowledge. Baddeley, (1990) indicates that spaced repetition results in more secure learning than massed repetition. Massed repetition involves spending a continuous period of time, say fifteen minutes, giving repeated attention to a word.

Spaced repetition involves spreading the repetitions across a long period of time, but not spending more time in total on the study of the words. This spaced repetition results in learning that will lead to remembering for a long period of time. Anderson & Jordan (1928) and Seibert(1930)(as cited in Nation, 1999) investigated retention over periods of up to eight weeks. They found out that most forgetting occurs immediately after initial learning and then, as time passes, the rate' of forgetting becomes slower. After this, the repetitions can be spaced further apart. Baddeley (1990), also, speculates that because long-term learning depends on physical changes in the brain, spacing repetitions allows time for the regeneration of neuro-chemical substances that make these changes. Massed learning does not allow enough time for these substances to regenerate; thus they cannot continue to make the physical changes needed for learning. Nation (2005) states that giving repeated attention to vocabulary is needed.

He suggests that in the early stages of learning, the encounters need to be reasonably close together, preferably within a few days, so that too much forgetting does not occur. Later, meetings with words can be very widely spaced out with several weeks between each meeting.

In Sweller's well-renowned Cognitive Load Theory (Sweller as cited in Sweller, et al. 2011), the two categories of Cognitive Load Theory, "intrinsic" and "extrinsic" loads of instruction, were differentiated. He contended that while the former refers to the intricacy of instruction and the learning tasks, the latter applies to the way information is presented to English Language Teaching learners. According to this theory, during the message design process, instructional materials should be simple to help transfer information from short-term memory to long-term memory. Mayer (2005) proposed the Cognitive Theory of Multimedia Learning based on the result of an experiment focusing on the use of multimedia instructional messages. In his theory, two main assumptions were made on the way people process these kinds of instructions. First, learners engage in the active processing of the instructional material. Therefore, a coherent mental representation of information is created as learners select information, organize it and integrate it with existing knowledge structures. Second, humans have separate processing channels for aural and visual information. Chandler and Sweller (1996) revealed that students receiving multimedia instruction with spoken text spent less time on subsequent problem-solving tasks, as opposed to those receiving visual-text instructions.

Research has shown that there are some particular contextual techniques used by EFL teachers and learners for teaching and learning vocabulary. Here are some of these techniques. William and Stoller (2001), for example, provide a list of explicit learning techniques in their article. These techniques include: analysis of word parts (prefix, root, suffix), associations (other words which would give clues of the meaning of the unknown word), cognate awareness (telling students some other words having the same etymology of the unknown word), dictionary activities, discussion of word meanings, flashcard, games, illustrations, drawings, realia, matching meaning and collocations, mnemonic devices, parts of speech tables (noun, verb, adjective, etc), semantic mapping and semantic grids, synonyms and antonyms and word family exercises. However, when using implicit learning technique the learners are not required to do vocabulary exercises or other explicit learning techniques. They just read as much as possible so that they are exposed to a word many times. (Genç, 2004).

According to Genç (2004), vocabulary learning techniques are divided into guessing meaning from the context and the mnemonic techniques. In guessing meaning from the context, the learners recognize clues to guessing the meaning of the word from the context. Mnemonics, on the other hand, aid the integration of new material into existing cognitive structures. Obviously, there are various techniques for teaching mnemonics such as Linguistic Mnemonics, Spatial Mnemonics, Visual Mnemonics and Physical Mnemonics. It is, thus, important to note that mobile or handheld devices emerged as a

viable instructional technology for supporting classroom teaching by giving students language-learning tools for independent study (Hokley, 2013).

The use of personal devices affords students' ownership of learning, which may lead to positive language learning experiences (Kukulka-Hulme, 2009). Devices used in mobile learning can range from cellular phones, smartphones, mp3 and mp4 players, iPods, digital cameras, data-travelers, personal digital assistance devices (PDAs), netbooks, laptops, tablets, iPads, e-readers such as the Kindle, Nook, etc. Handheld computers are portable computers, which are small and can be held in one's hand. At present, products like tablets, PDAs (Personal Digital Assistants) and smartphones are quite advanced. They can be used for calculating, browsing online, e-mailing, playing games and music, typewriting, recording video and audio and making phone calls. Cell phones are more common and the most popular of mobile devices. They are so advanced and 'smart' that they can perform almost the same functions and features as personal computers (Cui & Wang, 2008). This study focuses on one type only, which is the smart phone. With thousands of mobile apps buzzing around the internet, these apps are taking a standing role in today's world. They are used in almost every sector today, from industries, banking, education, entertainment, and media (Chen, Hsieh & Kinshuk, 2008). Hundreds of Apps, some of which can even be downloaded as free open sources, are widely available as the internet provides different mechanisms and algorithms to learn language in a simpler form. The famous among these Apps is called, "Ko\_Su" which is used for Android and Apple users.

Mobile learning has many benefits and advantages. Boyes (2011) pointed out that mobile learning fits many different learning styles as it provides texts, graphics, audios and videos to learners. Furthermore, mobile learning is convenient and flexible as it can be accessed anywhere, at any time, and also allows learners to direct their own learning. In addition mobile learning permits big data tracking, such as tracking how students use the course, what questions they got right and even their behaviors. Moreover, students are more likely to engage with the learning since they do the training on their own personal devices. Boyes explains that the small screens of mobile devices minimize the amount of information that can be offered to a learner at any given time, so avoiding cognitive overload. That is, mobile learning offers students easily digestible learning. According to Lan, Sung and Chang (2007), mobile assisted language learning (MALL) provides learners with the same chances for independent and targeted practice and instant corrective feedback in contrast to Computer Assisted Language Learning (CALL). In addition, mobile learning provides learners with easy-to-access multimedia information and engages them in a spontaneous learning environment in which learners can decide the place and time of their learning (Attewell, 2005). Shuler (2009) points out that mobile learning allows students to gather, access, and process information outside the classroom, thus helps in bridging the school, and home learning environments. In addition, it improves collaboration and communication, and at the same time, enables a more personalized learning experience as it is adaptable to individual and diverse learners (Pachler, 2010).



In spite of the above mentioned advantages of mobile learning, Şad and Göktaş (2013) listed some of the limitations of mobile devices and mobile learning. These limitations include the small screen size, the limited battery lives, limited storage space compared to computers and the absence of a keyboard. Some researchers argue that using mobile devices in the classroom can cause distractions and interruptions. Pachler (2010), for example, mentions several cognitive, social, and physical disadvantages which include the potential for distraction, unethical behavior, physical health concerns and data privacy issues. In addition, poorly designed mobile technologies can affect the usability of the devices and can distract children from reaching their learning goals. However, as indicated earlier, in spite of these challenges, the advantages of mobile learning are well recognized.

It is worth mentioning that researchers have used different mobile applications to investigate the effect of mobile phones on learning vocabulary. While some studies have used SMS, others have used MMS, emails, personalized applications and commercial applications. Thornton and Houser's (2005) study investigated the effectiveness of mobile phones on promoting vocabulary learning. They found that by using mobile email to send short lessons of English vocabulary words to students, students learned better when compared with those who learned the same material in Web-based or paper-based formats. Levy and Kennedy (2005) conducted a mobile SMS learning project for a college Italian course in Australia. The results showed that students in the SMS project were motivated to learn additional words. Moreover, the participants expressed positive attitudes toward this new method of receiving additional learning materials. Levy and Kennedy suggested that it is useful and possible to implement SMS as a learning support for foreign language learning. The two previous studies (Levy & Kennedy, 2005 and Thornton & Houser, 2005) seem to share an optimistic view that mobile phones can create an effective learning support for vocabulary learning. The researchers pointed out that the portable content enables students to practice the materials whenever and wherever they feel like studying. Also, they believed that the accessibility to the content motivates users to spend more time to study with the content, and hence to improve their learning achievement.

In Turkey, Başoğlu and Akdemir (2010) carried out a six-week study which investigated the effectiveness acquisition of a mobile phone-based flashcard application (ECTACO) on L2 English vocabulary. This application was used by 30 university students as the experimental group, compared to a print-based format used by their counterparts in the control group. Their findings confirmed that using the flashcards on mobile phones was more effective in improving students' vocabulary learning than using flashcards on paper. The experimental group also found learning English vocabulary this way to be both effective and entertaining. Also, Derakhshan and Kaivanpanah's (2011) investigated the impact of text messaging on EFL freshmen's vocabulary learning. This Iranian study describes a seven-week mobile phone-based program that used SMS for L2 English vocabulary acquisition with university students. Both control and experimental groups were taught 15–20 words per session. Students wrote one sentence for each word for their teacher and three classmates. The experimental group

sent these via SMS while the control students brought them to class on paper. After the twelve sessions of instruction, the post-test was administered. Two weeks later, a delayed post-test was given to students. The results showed that the experimental group had greater vocabulary gains in both immediate and delayed post-tests.

Apparently there seems to be a strong literature support for the impact of mobile learning on students' vocabulary learning. However, the literature support varies significantly depending on the type of learning (immediate and delayed), and the attributes of the mobile device (Abbasi & Hashemi, (2013); Alemi, Sarab & Lari's 2012; Azabdaftari & Mozaheb, 2012; Hayati, Jalilifar & Mashhadi, 2013); Motallebzadeh, Beh-Afarin, & Rad, 2011;Saran, Seferoglu & Cagiltay, 2012; Suwantarathip & Orawiwatnakul, 2015). It is hoped that the findings of this study would contribute to the theory and practice of vocabulary teaching and learning.

## **RESEARCH DESIGN**

This quasi-experimental study used pretest, posttest 1 and posttest 2, control group design to test the impact of mobile learning on vocabulary learning, and retention. In this study, both the control and experimental groups received conventional instruction in their English classes. However, while the control group received the vocabulary exercises as homework and its feedback in printed papers, the experimental group received the vocabulary exercises as homework and its feedback via the mobile application (Ko-Su). The experimental group received eleven vocabulary exercises as homework during three weeks of teaching Theme Two, which consists of five units. The students received them either daily or every two days, depending on the time spent in teaching each unit. The students received the lesson, submitted it and then obtained feedback from the teacher in a format of a report or a comment. The experiment lasted for approximately eight weeks. After finishing Theme Two, the two groups were given the vocabulary test as posttest1. One month after receiving posttest 1, posttest 2 was administered to the two groups.

## **METHOD**

### **Population and Sample**

The population consisted of Grade 11 students in Post Basic Schools in Dhofar (1671 female students). Two schools were selected: A'Saadah Post Basic School and Al Nahda Post Basic School. Two classes comprised the sample of the study, one class from each school. The two classes were randomly assigned. To select the experimental group among nine classes of Grade 11 in A'Saada School, four classes were selected using a draw. The four classes were given the internet and mobile usage survey. The class with the largest number of mobile phone users and greatest accessibility to internet was chosen to be the experimental group. To select the control group, among ten classes of Grade 11 in Al Nahda School, one class was selected using a draw. The experimental class included 29 students and the control group 29 students as well. However, due to some student absence in the pretest, posttest 1 or posttest 2, the number of the control

group decreased to 24 students. The sample in experimental group also dropped to 22 students due to similar reasons or withdrawal from the experiment due to lack of access to internet.

### **Research Instruments**

Two research instruments used in this study were vocabulary test that served as a pretest, posttest1 and posttest2 to investigate the effect of using mobile-based exercises in learning and retaining vocabulary. It was administered as a pretest prior to the treatment to test learners' knowledge of the target vocabulary and to ascertain the equivalence of the students in the experimental and control groups. As post-test one, the same vocabulary test was also administered to both groups after the treatment to identify the impact of using the treatment (i.e., mobile-based vocabulary exercises) on students' vocabulary learning. After one month, the same test was used as post-test two. It was administered to both groups to measure the effect of using the treatment (i.e., mobile-based vocabulary exercises) on students' vocabulary retention.

The vocabulary test was designed following the same format of vocabulary questions in Grade Eleven English Final Examination by The Ministry of Education (MoE). It consisted of three main questions, including 25 items in multiple choice and completion formats. These items therefore represented the target vocabulary that was taught in class and practiced using mobile-based and paper-based exercises. The target vocabulary consisted of ninety-two words from Theme Two, Grade 11B, *Engage with English*. The test measured the recognition and production of the target vocabulary. It tested students' knowledge of the words which included knowing the meaning of the words in the context, knowing the use of the words, knowing the format of the words and knowing the grammar in which words would be used. To establish the reliability of the vocabulary test, it was piloted on a group of 32 female students from Grade 11 in Khawla bint Hakeem Post Basic School. The Cronbach's alpha coefficient was  $r = 0.724$ .

### **The Vocabulary Exercises**

Two types of vocabulary exercises were used in this study. While the control group was given paper-based exercises as the conventional way of providing exercises to students, the experimental group was given mobile-based exercises. The same format of the questions was used in the two types, the multiple choice format, to avoid the interference of using other types of questions. The two types also contained the same content of the questions and had the same order. The only difference was the platform of the exercises.

### **The Paper-Based Vocabulary Exercises**

The paper-based vocabulary exercises covered 92 words, representing the target words in Theme 2. They contained eleven exercises covering the five units in Theme 2. The questions covered knowing the words in terms of knowing the meaning of the words in the context, knowing the usage of the words, knowing the format of the words and knowing the grammar in which the words are used. The eleven paper-based vocabulary

exercises were administered to the control group during the time of teaching Theme 2. The lessons were given daily or every two days, depending on the duration of teaching each unit in Theme 2. It is worth mentioning that the administration of the paper-based vocabulary exercises was conducted at the same time of administrating the mobile-based vocabulary exercises to the experimental group.

### The Mobile-Based Vocabulary Exercises

Similar to the paper-based vocabulary exercises, the mobile-based exercises covered 92 words, representing the target words in Theme 2. They contained eleven exercises covering the five units in Theme 2. The questions covered knowing the words in terms of knowing the meaning of the words in the context, knowing the usage of the words, knowing the format of the words and knowing the grammar in which words are used. The exercises were designed and delivered in the Ko-Su application (see figures 1, 2, & 3). The researchers designed the exercises. The application provided different formats for the questions such as multiple-choice, completion, writing, matching, etc. However, the researchers chose the multiple choice format to be systematic with the format of the paper-based exercises. The eleven mobile-based vocabulary exercises were administered to the experimental group during the time of teaching Theme 2. The lessons were given daily or every two days, depending on the duration of teaching each unit in Theme 2. It is worth mentioning that the administration of the mobile-based vocabulary exercises to the experimental group was conducted at the same time as the administration of the paper-based vocabulary exercises to the control group.

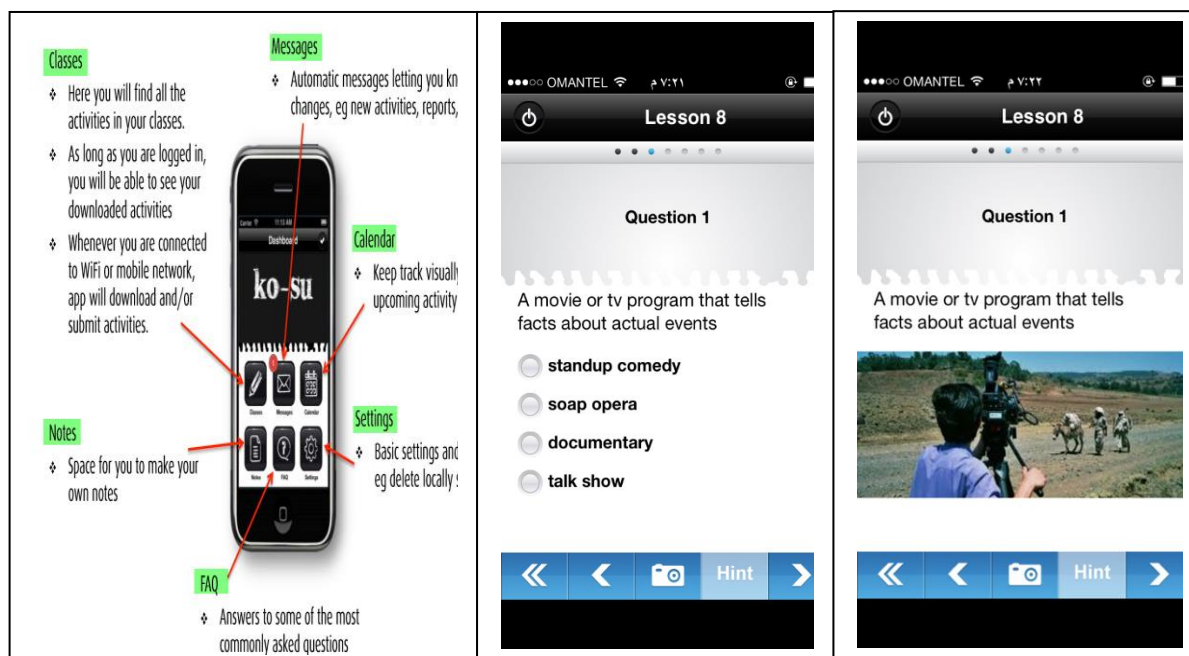


Figure 1. Ko-Su screen display

Figure 2. Vocabulary question

Figure 3. Vocabulary

## Establishing the Equivalence of the Two Groups

To ascertain the equivalency of the two groups before the treatment, the researchers administered the pretest to the experimental and control groups. Table 1 presents the results for the pretreatment responses on the pretest by groups.

**Table 1.** Independent Samples T-test Results for Pre-Treatment Responses on the Pretest

| Group        | N  | Mean* | Std. dev | t-value | Df | Sig. (2-tailed) |
|--------------|----|-------|----------|---------|----|-----------------|
| Experimental | 22 | 9.54  | 4.944    | 1.054   | 44 | .041            |
| Control      | 24 | 12.66 | 5.113    |         |    |                 |

\*The total score =25

The results in Table 1 show that there was a significant difference between the control and experimental groups in the mean pretest scores of the two groups. The t-value for these scores was 1.054, which is significant at the 0.05 level. Since the two groups were not equivalent, this study used ANCOVA as a statistical equating measure to present the results of posttest1 and posttest2. The researchers provided the experimental group with the necessary training regarding using emails and Ko-Su application and clarified students' questions regarding the use of emails, the Ko-Su app and the mobile-based vocabulary exercises. The students also received hard copies of the guide manual to be used as a guide and reference during the experiment.

## Ko-Su Application

Ko-Su is an innovative mobile learning platform where anyone can teach and learn via mobile devices. Teachers and learners can register for free via the Ko-Su website. It allows teachers to create mobile learning activities in any language, invite anyone to their own class and publish their activities to their class. It can be used by individuals, schools, small businesses and large corporates alike. Ko-Su goes beyond the traditional classroom. Activities can be done anywhere a mobile device can go and anyone can be invited. Training or homework via Ko-Su can be done on the bus or the train on the way home. Learners can even participate in a language class with a teacher located overseas.

The interactive activities are created using the user friendly and intuitive task templates that support text, images, audio, videos, multiple choice, free text questions and even drawing tasks. KO-SU was developed after extensive experimentation and piloting in the area of mobile learning. It has set a whole new level with regards to user experience, allowing subscribers to create interactive activities optimized for the mobile screen. Also, anyone can be invited to classes, thus extending participation in learning to the broader community. Teachers can give feedback via the app as comment or report. Students can receive the reports and download them as well (<https://ko-su.com/>).

## Procedures

Before starting the experiment, both groups took the pre-test to ensure equivalence in vocabulary knowledge. The experimental group received tutorial lessons about creating email accounts and using Ko-Su app. The researchers supplied the teacher of the control group with the paper-based vocabulary exercises and kept in touch with her on a daily basis to ensure that the two classes got the teaching and exercises at the same time. The teacher gave the experimental group a tutorial on how to use the app in this experiment. Copies of the guide manual were given to the students in the experimental group as well. In order to allow students of the experimental group to do the mobile-based vocabulary exercises, the researchers sent a class invitation to students' emails and ensured that all students were registered in the Ko-Su website and logged in the Ko-Su app in their phones.

The paper-based vocabulary exercises were given to the control group to be done at home and submitted in the next day. The same procedure was applied to the experimental group. Mobile-based vocabulary exercises were sent via Ko-Su app to students after each lesson. The exercises started at 2:00 p.m. and ended at 11:00 p.m. While the control group received individual feedback the day after submission, the experimental group received individual feedback through comments and reports sent via the Ko-Su app on the day of submission. Facilitation and guidelines about how students should do their mobile-based exercises were provided whenever necessary. Immediately after teaching Theme 2 and completing the paper/mobile-based vocabulary exercises, post-test 1 was administered to both groups to determine the impact of the type of the platform of vocabulary exercises on students' vocabulary learning. One month later, post-test2 was administered to both groups to determine the impact of the type of the platform of vocabulary exercises on students' vocabulary retention.

## RESULTS AND DISCUSSION

In order to address research questions, ANCOVA was used to compare the experimental group to the control group on posttest1 and posttest 2 using pretest scores as covariate to ensure the homogeneity of the two groups.

### Analysis and Description of the Vocabulary Test

#### *Analysis of Post-Test1.*

**Table 2.** Mean Difference in Posttest 1: Responses of the Groups.

| Group        | N  | Mean* | S. d |
|--------------|----|-------|------|
| Experimental | 22 | 18.91 | 5.96 |
| Control      | 24 | 20.33 | 4.30 |

\*The total score =25

**Table 3.** ANCOVA Results of Posttest1

| Source   | Type III Sum of Squares | Df | Mean Square | F   | P    | Eta Squared* |
|----------|-------------------------|----|-------------|-----|------|--------------|
| Pretests | 617.6                   | 1  | 617.6       | 48  | .000 | .53          |
| Group    | 8.4                     | 1  | 8.4         | .66 | .423 | .015         |
| Error    | 553.5                   | 43 | 12.9        |     |      |              |
| Total    | 1194.4                  | 45 |             |     |      |              |

\*According to Cohen (1977), Partial eta squared may be interpreted as .01 = small effect size, .06 = medium effect size, .14 = large effect size.

Table 2 displays adjusted posttest 1 means in both groups after using ANCOVA. Table 3 displays ANCOVA results using adjusted pre-test scores. The results indicated that the adjusted post-test 1 mean of the experimental group ( $M = 18.9$ ,  $SD = 5.96$ ) was not significantly different than the adjusted posttest 1 mean of the control group ( $M = 20.3$ ,  $SD = 4.30$ )  $F = .66$ ,  $p = .423$ . There was no significant difference in vocabulary achievement between the two groups in posttest 1 at 0.05 level, which answers the first question of the study. Thus, there was no significant difference in vocabulary achievement between students who learned vocabulary through mobile phones and students who learned vocabulary in the conventional way. That may be attributed to students' unfamiliarity with the platform. The experimental group at the time of posttest1 (after only two weeks of using mobile-based exercises) hadn't yet got all the benefits that mobile learning offers. Wenglinsky (2006) states that the more time students spend using the instructional technology in their learning, the higher their achievement scores are. However, both groups achieved better in the posttest1, which indicates that both platforms (papers and mobile phones) were beneficial in vocabulary learning.

### **Analysis of Post-Test 2.**

**Table 4.** Mean Difference in Posttest 2: Responses of the Groups

| Group        | N  | Mean* | S. d |
|--------------|----|-------|------|
| Experimental | 22 | 21.68 | 3.92 |
| Control      | 24 | 19.83 | 4.79 |

\* The total score =25

**Table 5.** ANCOVA Results of Posttest2

| Source   | Type III Sum of Squares | Df | Mean Square | F    | Sig. | Eta Squared* |
|----------|-------------------------|----|-------------|------|------|--------------|
| Pretests | 216.7                   | 1  | 216.7       | 14.7 | .000 | .254         |
| Group    | 108.5                   | 1  | 108.5       | 7.3  | .010 | .146         |
| Error    | 635.4                   | 43 | 14.8        |      |      |              |
| Total    | 891.3                   | 45 |             |      |      |              |

\*According to Cohen (1977), Partial eta squared may be interpreted as .01 = small effect size, .06 = medium effect size, .14 = large effect size.

Table 4 displays adjusted posttest 2 means in both groups after using ANCOVA. Table 5 displays ANCOVA results using adjusted pre-test scores. The results indicated that the adjusted post-test 2 mean of the experimental group ( $M = 21.68$ ) was significantly different than the adjusted post-test 2 mean of the control group ( $M = 19.83$ )  $F = 7.3$ ,  $p = .010$ . This means that there is a significant difference in retaining vocabulary between the two groups in posttest 2 in favor of the experimental group at 0.05 level. The effect

size is 0.146, which is considered large according to Cohen (1977). That answers the second question of the study. Thus, there is a significant difference in vocabulary retention between students who learned vocabulary through mobile phones and students who learned vocabulary in the conventional way.

The results of this study indicate the usefulness of using mobile phones in retaining vocabulary. These results confirm those of other similar studies (Abbasi & Hashemi, 2013; Basoglu & Akdemir, 2010; Motallebzadeh, Beh-Afarin & Rad, 2011; Motallebzadeh & Ganjali, 2011). The results also support the research that investigated using m-learning for vocabulary gain (Hayati, Jalilifar & Mashhadi, 2013; Lu, 2008; Saran, Cagiltay & Seferoglu, 2008; Thornton & Houser, 2005). According to Thornbury (2004), there are two factors that determine retention: easiness of the words and the spaced learning of the words. That is, words that are easy to learn are better retained and words that are learned over spaced learning periods are retained better than words that are learned in concentrated bursts. The findings of Thornton and Houser (2005) are in congruence with the cognitive psychological research which states that constant and distributed practice has more beneficial impact on memory and learning than massed practice. Thus, regular studying using mobile learning provides students with more chances for exposure to the learning tasks.

Another appealing attribute s of this technology is the bite-sized lessons provided by most mobile-phone instructional programs. As the findings of Lu (2008) and Motallebzadeh & Ganjali (2011) demonstrate, mobile phones as a learning tool can facilitate certain forms of learning. According to the researchers, mobile messages can be easily sent at programmed times and intervals. They can be stored systematically and be accessible for later retrieval. Words are memorized significantly better when they are presented apart than when they are presented together at one time (Nation & Meara, 2002). Thus, learners feel that the chunks of those lessons are more manageable than lengthy lessons on paper. They are more capable of dealing with a limited amount of information at a time.

M-learning starts from the assumption that learners are continually on the move. Lu (2008) stated that the portability and immediacy of mobile devices allow students to learn in their preferred time and place. According to Hayati, Jalilifar and Mashhadi (2013), the benefits of being able to learn on the move at any location underpin an approach toward a flexible as well as a personalized learning environment in which students can access learning from a variety of out-of-the-classroom places. It is this autonomy that helps overcome many motivational obstacles to learning for many students, as it sets them free from studying under fixed and even monotonous educational routines. Lu (2008) and Hulstijn and Laufer (2001) stated that mobile phones can be an effective medium for self-learning L2 vocabulary. According to Basoglu & Akdemir (2010), mobile lessons offer a novel learning experience as well as promote a relaxing atmosphere in which to learn. The lessons are manageable chunks and learners can study whenever they use their mobile phone, which is connected to an enjoyable memory. In addition, Basoglu & Akdemir (2010) found that there is a positive



correlation between the frequency of SMS reading and vocabulary gain. Thus, the more frequently students read the messages, the more the amount of vocabulary gain. The experimental groups in the current study reported that they referred back to the words in their phones regularly after the experiment, which can explain their higher retention rate. After post-test 2, the researchers in the current study asked the students in the experimental and control group if they referred back to the vocabulary exercises after post-test 1. Many of the students in the experimental group reported that they did refer to the exercises, as they were always accessible in their phones. However, less than half of the students in the control group referred to the exercises in papers. This may explain the difference in vocabulary retention in post-test 2. It appears that those students learning words via the Ko-Su app on their mobile phones benefited from the 'push' aspect of mobile technology as mentioned in Lu (2008). That is, students in this group had more exposure to timely bite-sized instructional materials regularly than those in the control group.

## CONCLUSION

Given the challenges that students faced in using the mobile-based exercises, the results revealed that there is no significant difference between the two groups in the immediate posttest. However, the experimental group outperformed the control group in the delayed post-test, which means that they retained vocabulary better. This study extends the use of mobile phones - which are already used for communication and entertainment all over the world - to classroom learning. Using mobile phones in learning vocabulary outside the classroom allows more exposure and interaction with the learned words, resulting in better retrieval of the vocabulary knowledge. Therefore, mobile learning can be of great help in improving the quality of teaching and learning processes in English as a foreign language in Omani schools. Hence, instructors should take into account the challenges that students in Omani schools face in using technologies including mobile phones. Based on the findings of this study, it can be concluded that:

- Mobile devices provide tremendous opportunities for learning, especially outside the class because they are constantly available.
- The immediacy and novelty of mobile-based lessons and their manageable amount of information can foster students' vocabulary learning. Moreover, the positive effect seems to compensate for the restraints of mobile phones. Future instructional projects via mobile technology should take advantage of m-learning to increase students' exposure to the target language.
- Mobile phones can be more effective and efficient media for self-learning English vocabulary than the paper-based materials in that it increases learner motivation, which in turn increases the frequency of reading the lessons and maximizes the exposure to the target language.

- For learners of this "Apps" generation, a bite-size but regularly delivered information via mobile devices and phones appears to match their learning styles and thus have positive impact on their attitudes and motivation to learn.

In light of the findings of this study it can be argued that mobile phones can provide effective platforms for extending the students' learning landscape. Further studies in this area should consider more demographic and contextual variables in relation to various attributes of Apps and mobile devices.

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