

# Integrating M-technology into Web-based ESL Vocabulary Learning for Working Adult Learners

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## Abstract

*The paper reports on a small pilot study that explores the role of mobile technology (m-technology) in English as second language (ESL) vocabulary learning for working adult learners. In this study, through the use of Short Message Service (SMS), m-technology was integrated into web-based vocabulary learning for working adult learners. This pilot study examined learner experiences of m-technology used in the workplace in Hong Kong. Ten learners were involved in the study. Both quantitative and qualitative methods were adopted through assessments using an online test system and an open-ended questionnaire sent by email to collect data. The research findings show significant improvements in the learner performance and in their attitudes towards using m-technology in their learning.*

## 1. Introduction

The paper reports on a small pilot study that explores the role of mobile technology (m-technology) via Short Message Service (SMS) combined with web-based technology in English as second language (ESL) vocabulary learning for working adult learners. M-technology is developing very quickly, adding features and converging technology applications into a mobile, wireless handheld environment. Various countries have experimented with various m-technology projects in education. A host of m-learning research findings have showed that m-technology bears the unique characteristics of immediacy, expediency, interactivity and flexibility [1] and has relatively cheap ongoing costs [2]. M-technology affordances [3] allow learners to remain connected and learners no longer need to be constrained by specific time and place restrictions. Students have the potential to locate learning materials and contact fellow learners or tutors “just-in-time”. In other words, “m-learning (elearning using mobile devices and wireless transmission)” [4] can happen

wherever learners are free to participate and whenever they want or need to. Therefore, m-technology is considered to be a promising device for collaborative and constructive learning [5], teacher training [6], and even a test administration option [7].

However, m-learning is “often associated with a simplistic understanding of facilitating learning by delivering learning content” regardless of the highly valued “active, productive, creative and collaborative learning methods” in modern education and pedagogy [8]. Roschelle [9] further points out that mobile device educational applications take an overcomplicated view of technology and a simplistic view of the social practices surrounding these applications. Complicated non-compatible designs of m-technology without scale for feasible pedagogical applications are problems to be confronted and resolved. As a starting point, this research uses relatively simple m-technology to ensure easy adaptability in a pedagogical environment. The following research questions are to be addressed in this study:

(1) what attributes of m-technology can meet pedagogical needs?

(2) can rich innovative pedagogical practices arise out of the use of simple m-technology?

The research work undertaken in this study is an attempt to begin answering these questions. A pilot study examining learner experiences of m-technology was designed and carried out in Hong Kong.

Hong Kong has about 8.00 million mobile phone subscribers out of a 6.84 million population [10]. In other words, 17.1 percent of the population owns more than one mobile phone. This provides a solid basis for using mobile phone technology in m-learning contexts.

In order to survive in the competitive world, especially in Hong Kong, many adult learners need continuous professional development in a variety of disciplines. According to the Hong Kong government’s EMB (Education and Manpower Bureau) [11], in 2001, over 73.5 percent of 430,086 adult learners chose part-time training programmes and 17.8 percent chose programmes based on online learning, self-study, etc. These figures suggest that there is a great demand for

good continuing training and educational programmes in Hong Kong, and that these programmes need to be timely and cost-effective to fully benefit adult learners' needs, especially learners with full-time jobs.

Young [12] contends that web-based learning is beneficial to learners in that it makes education accessible to a range of learners who can make the most out of "anytime, anywhere learning". However, with wired web-based learning, anytime, anywhere learning is hard to achieve. Moreover, even though wireless web-based learning is possible, due to the limitations of m-technologies such as small screen size, limited storage and unstandardised platform amongst various mobile devices, m-learning alone for some programmes is not desirable.

However, research into technology merging and the use of different combinations of technologies in different contexts have produced some promising results. For instance, m-learning and game-based learning by itself is not unique, the combination of the two kinds of learning could help reshape conventional learning and provide powerful new opportunities for students [13]. Accordingly, this small pilot study, integrating m-learning via SMS into web-based instruction, is an attempt to move in such a direction, taking English vocabulary learning as the content area.

## 2. Research methodology

### Theoretical framework and pedagogical design

Groot [14] examined a set of theories that attempted to address how the mental lexicon is structured and how it operates, and proposes that we learn best when there is gradual acquisition of new words through repeated exposure in a wide range of authentic contexts. Groot points out, normally, there is not enough time for appropriate exposure to new words of the same intensity as in first language acquisition and that there is no easy solution to this difficulty. The most realistic approach is to create an environment that is most conducive to learning new words, by striking a balance between frequency of exposure and a range of contexts offered for the new words.

Therefore, the designed programme in this study put an emphasis on presenting the features and functions of vocabulary-in-context [15] on the web and audio is provided for both the texts and vocabulary to expose the learners to a multi-model input. In addition, new words and expressions are delivered through SMS twice a day based on the assumption that reviewing words of a foreign language at spaced intervals may facilitate long-term memory storage [16].

There are four topics for vocabulary learning, namely, nightlife, food, weather and traveling. Each

topic has four days learning content with learning resources of On-line Dictionary, Vocabulary Tips and Cultural Tips for the learners to refer to. New words and expressions sent on the mobile phones through SMS and on the web, have, basically, the same content except that explanations of vocabulary in SMS messages are shorter than those on the web due to SMS limitations of some mobile phones, allowing only 160 letters to be sent each message (See Figures 1 and 2). However, shorter messages may not be a disadvantage in learning. According to Thornton and Houser's [17] research findings, both short and long messages for English as a foreign language vocabulary learning via mobile e-mail produce similar results though further investigations are claimed to be made.

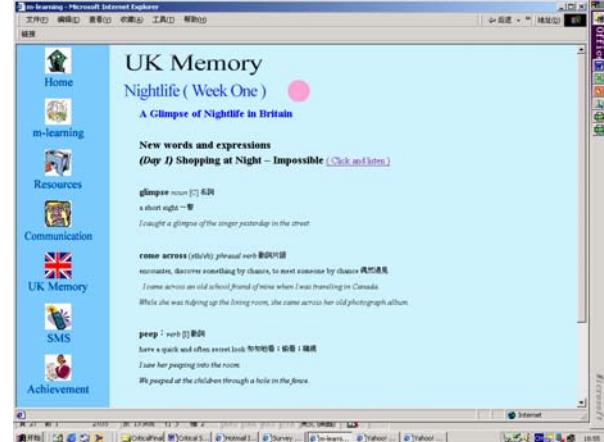


Figure 1. Screenshot of new words and expressions on the topic: nightlife



Figure 2. SMS on the topic: nightlife

E-mail asynchronous computer mediated communication was designed for communication between students and the tutor and among students themselves. In addition, students are also suggested to communicate with their friends via SMS.

Ten adults with eight junior high school graduates and two senior graduates in Hong Kong participated in the study. All, with ages ranging from 18-40 years, have full-time jobs in three different companies. Business travel for these participants is essential.

The web-based learning material was delivered by Xyber-learning Technology Company, Ltd. and an on-line test system was provided by the company so that

data of timing, date of access and scores of each test response were recorded in the database.

The course lasted four weeks. Two forms of learning content, namely, web-based learning content and SMS messages of new words and expressions were delivered synchronously on a daily basis. From Monday to Thursday each week, learners were expected to finish studying one topic in four days both by visiting the web-materials and reading the new words and expressions received on their mobile phones through SMS. On Friday, the learners were expected to review the content learned during the previous four days on the website. They also received all the new words and expressions in the previous four days through SMS to reinforce their learning. On Saturday, a Self-check was prepared for the learners as an ongoing assessment to evaluate what they had learnt during the week. They were also recommended to refer to the resources section on the website.

## Evaluation

Warm-up assessment as pre-test and My-achievement assessment as post-test were collected at both the beginning and end of the study in the recorded system on the website in order to check whether there were improvements in the learning outcome. Each topic of the UK Memory is followed by a Self-check ongoing assessment (once a week) to consolidate what the learners have learned. There are two parts in Self-check, with Part One focusing on reading comprehension and Part Two using Multiple-choice close items.

An open-ended questionnaire containing 13 questions was constructed to elicit the learners' perceptions about the advantages and disadvantages of integrating m-learning into web-based vocabulary learning. The questionnaire was distributed to all the ten learners through email. All of them responded.

## 3. Results and discussions

### Pre-test and post-test

In order to examine whether or not there were initial significant improvements in the learner's instructional vocabulary learning compared with their pre-learning, measures of central tendency (means and standard deviations) were compared and correlated t-tests were conducted on data obtained from assessment results of the Warm-up and My-achievement assessments in the on-line test system. Tables 1 and 2 summarise the results obtained.

Though the standard deviations for each of the indicators (Mark and Time) in Tables 1 and 2 show

that there is a wide range of distribution of scores or time variability in both Warm-up (One, Two & Total) and My-achievement (One, Two & Total) assessments, there are marked differences between Warm-up and My-achievement assessment means of both Mark and Time test results, which indicates a marked improvement in the scores of My-achievement assessment over those in Warm-up assessment. Also the learner's performances were higher though less time was taken to complete My-achievement assessment (Part one, Part two and Total). The wide range of Mark and Time distribution may be due to the differences in personal factors such as age and language proficiency.

In terms of Mark and Time t-test values, in Warm-up assessment, the t-test values are not significant in general. However, the t-test values on My-achievement scores are very significant, which indicates a substantial improvement in scores in My-achievement assessment (One, Two & Total).

**Table 1. Warm-up and Achievement assessment comparisons in Mark**

Mark				
Test type	Means	SD	t-value	p-value
Warm-up (One)	49.90	12.45	-4.507	0.001*
My-Achieve (One)	75.00	12.53		
Warm-up (Two)	53.00	13.02	-3.068	0.013*
My-Achieve (Two)	77.60	13.66		
Warm-up (Total)	109.20	22.35	-4.228	0.002*
My-Achieve (Total)	151.00	23.42		

\* Statistically significant for t-tests

**Table 2. Warm-up and Achievement assessment comparisons in Time**

Time (second)				
Test type	Means	SD	t-value	p-value
Warm-up (One)	353.70	247.62	1.587	0.147
My-Achieve (One)	247.50	138.25		
Warm-up (Two)	431.67	236.68	2.516	0.033*
My-Achieve (Two)	255.9	117.55		
Warm-up (Total)	798.78	498.89	1.803	0.105
My-Achieve (Total)	533.11	217.52		

\* Statistically significant for t-tests

Regarding correlations between Time and Mark in the same test, and Time or Mark in different assessments, there are no statistically significant differences in any of the assessments, indicating that those who performed highest on the Warm-up assessment might not score the highest on My-achievement assessment. And also those who performed highest might not take less time in doing the tests. The contributing reasons deserve further study.

Also, measures of central tendency (means, and standard deviation) and correlations of the four Self-check assessments in the UK Memory were examined, but no significant statistics are found. However, the means of scores in the four Self-checks are comparatively higher than those of the Warm-up,

which shows that the learners did have some improvement in their whole learning process.

### Open-ended questionnaire

At the end of all the learning activities, the learners completed the open-ended questionnaire containing 13 questions in order to gain their insights into integration of m-learning in web-based vocabulary learning.

To check whether the learners received all the SMS messages in time (Q1), eight learners responded with positive answers, and the other two said that they received most of the messages. This shows the immediacy attribute of SMS m-technology and indicates that using m-technology via SMS in learning is feasible especially if some improvements are made.

When asked about what they did after having received these messages (Q2) and whether the messages were helpful for their vocabulary learning (Q3), nine learners reported that they read these messages at their convenience both in terms of time and place. Seven learners reported the new words and expressions were helpful for them; two reported some of them were helpful and some were not because they were not applicable in their work.

As to whether they communicated with other learners using emails or SMS (Q4), only two learners responded positively, the rest responded negatively. Emails were sent to some of them and asked them the reasons for their lack of communication. One responded, "I don't want to, because I think I can't get their response quickly". Another replied, "I don't have time, I'm very busy every day". This suggests that using emails and SMS as major means of communication appears not interactive enough, hence needs improvement.

When asked about the effectiveness of the SMS messages reminding them of doing the tasks on the web (Q5), seven responded positively, two reported "not really" or "helpful but not so effective", and one learner did not respond. This indicates that SMS as a "monitor" or "guide" for the distance learners is generally helpful.

Concerning difficulties (Q6), how they solved their problems in their learning (Q7), whether they referred to the resources on the Web (Q8), six learners reported they didn't have any difficulties; four mentioned they had difficulties but did not have enough time to solve them. However, seven learners responded that when they had problems in their learning, they used the dictionary or referred to the web resources provided, two learners responded that they discussed the matter with friends. This shows that on-line resources, especially dictionaries are useful for the learners in solving some of their difficulties in vocabulary learning.

When the learners were asked whether they were motivated by the way of learning (Q9); if yes, why they were motivated (Q10); if not, why they were not motivated (Q11), eight responded that they were motivated or sometimes motivated by the learning. Some mentioned that it was the first time for them to use mobile phones in their learning and felt that it was really convenient for anytime, anywhere vocabulary learning, some expressed their surprise and interest in the m-learning programme which could make learning happen even when they were commuting because they are connected all the time. Some valued SMS positively in that it reminded them of their learning and gained more opportunities to learn. And only two learners were not motivated by the learning because the learning was not compulsory (i.e., they didn't have to pass compulsory exams). This shows that most of the learners keep a positive attitude towards the combined way of learning and enjoyed the attributes of m-technology in learning, namely, the convenience, portability, connectivity, "push aspect" [18] of m-technology via SMS messages.

When asked problems in the learning programme (12) and suggestions for future the learning using m-technology (13), the responses were varied. One noted the problem of m-learning, "Learning through SMS is cheap and good, but most of the cellular phones have not enough memory to store the learning content". One learner suggested, "We can use multi-media content though mobile access later, and the learning will be more exciting". Two said that there should be more assignments for them to do, another three said that it was good enough for them. Some responded that they needed longer time, or the content should be related to their work, or they should learn by self-motivation, or they want to choose the learning materials sent through SMS by themselves. This indicates the use of SMS technology in learning has its limitations, though the latest mobile phones have increased memory and equipped with mobile drive adaptors, and also the needs of the learners should be more properly addressed in the design of the learning programme.

## 4. Conclusions and implications

The pilot study created opportunities for learners to experience a hybrid form of learning that they had not experienced before. The research test results and questionnaire survey show that the learners' performance was marginally improved and their attitude towards the use of the combined technologies was positive. The study also trialled the attributes of m-technology via SMS in an educational setting. According to the questionnaire survey, the attributes of m-technology via SMS, namely, convenience,

connectivity, portability, immediacy and push aspect are appreciated by the learners. In addition, SMS technology can also work as a reminder and even as a motivator for learning. The small scale study indicates that with careful pedagogical design, adoption of simple m-technology linked to web-based activities and resources may significantly enhance educational opportunities for learners and bring about paradigm shift.

However, several limitations of the study should be noted. First, owing to the limited time, technical support, number of subjects involved and the narrow focus of the m-learning project, the results have to be interpreted with caution. It should also be emphasised that interactivity was not fully achieved in the learning because of the limitations of SMS technology. Moreover, it seems that learning would be more contextual if the curriculum was designed to meet working adult learners' immediate needs. Nevertheless, the pilot study renders significant implications for future developments.

Mobile devices are becoming more ubiquitous and more powerful, becoming rich in multimedia (visual, audio & oral), fast in processing speed and accessing uniform platforms. For example, Microsoft has pioneered a strong uniform platform that supports various mobile and online devices [19]. The new breakthroughs have created immense opportunities for the use of m-technologies, providing new opportunities to innovate in education. With holistic pedagogical curriculum design, effective learning may occur independent from time and space by a hybrid adoption of m-technologies and other digital technologies even without the use of complicated technological design. This is to say that learning may occur in various contexts, either in the same physical setting, or in different physical settings, or through virtual reality depending on the learners' needs. Such kinds of learning will be more flexible, personal, expedient and interactive than ever before. Longitudinal studies on such kind of learning need to be attempted on wider range of learners, especially adult learners in China where mobile telephony is expanding rapidly.

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