Impact of Mobile Assisted Language Learning (MALL) on EFL: A Meta-Analysis

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Abstract

Mobile Assisted Language Learning (MALL) has emerged as a potential tool in the instruction of English as a foreign language (EFL). Meta-analysis of 13 studies published between year 2008 and 2015 was conducted. Four point criteria for the selection of studies for analysis is based on the year of publication, quasi-experimental design, pretest and posttest method and finally use of mobile device for intervention. Findings of the analysis suggest that MALL has fostered the EFL instruction. Overall effect size was ($d = 0.8$) which is considered a large effect size.

Keywords: MALL, technology assisted language learning, EFL, vocabulary acquisition, vocabulary instruction, meta-analysis

1. Introduction

We live in a world now so obsessed with speed (Devine, 2014). In fact speed is one the most defining ideals of our lives. Speed is further propelled by technological innovations in the field of telecommunications. It has reached mind boggling limits of 1tbs/s (Hecht, 2004). The web has registered a phenomenal growth of 806 % over the past fifteen years with more than 3.2 billion users (http://www.internetworldstats.com/stats.htm). Mobile phones are used by over two billion users. An average American is glued to electronic screen for about 56% of a workday (http://www.smartinsights.com/mobile-marketing/). Ubiquitous nature of this connectivity has drawn the interest of educators worldwide. In this regard, language studies are of particular beneficiaries. Since use of language is free of time and place constraints, it stands to reason that its instruction may also be free of such constraints. Mobile phones offer such an opportunity where language can be learnt anywhere and anytime.

2. Literature Review

Mobile phones have recorded a tremendous growth since Chickering and Ehrmann (1996) coined the term MALL (Mobile Assisted Language Learning). More recently, the term has been associated with mobile phones. These phones with user friendly interfaces, ubiquitous access and improved data storage and retrieval capacities offer a good platform for learning (Gabarre, Gabarre, Din, Shah, & Karim, 2014; Godwin-Jones, 2011; Miangah & Nezarat, 2012). Insights from CALL (Computer Assisted Language Learning) can be used to inform the learning activities presented through mobile phones (Kukulska-Hulme, 2005). Because these phones are miniature form of PCs with additional benefit of portability which surpasses laptop computers. This leap of technology from lap to palm has literally given a potential language learning tool in the hands of the teachers and their students (Kukulska-Hulme, 2009). Our lives are deeply immersed in technology. Same view was held by a majority of participants (Huw Jarvis & Achilleos, 2013). Mobile

phones can deliver interesting, engaging and motivating learning activities. Learners like these affordances of mobile technology where they can connect with their peers to complete learning activities (Palalas, 2011). Completing learning tasks collaboratively through mobile phones was found effective (Lan, Sung, & Chang, 2007; Lim Abdullah, Hussin, Asra, & Zakaria, 2013). From the standpoint of transactional distance, also mobile phones have an advantage. The instructors can initiate the learners into a learning environment where they provide initial scaffolding and then gradually withdraw the support to allow learners take charge of their learning (Park, 2011). MALL fits well into PPP (Presentation, practice and production paradigm). Mobile phones can present rich learning material in multimodal ways (HA Jarvis, 2015; Mayer, 2003). Evaluation of six pilot projects in developing countries (Valk, Rashid, & Elder, 2010) concluded that mobile phones have the potential to impart instruction. They have the potential to help create an environment that is conducive for a variety of learning scenarios such as formal and informal learning (Lung-Hsiang Wong, 2012).

SMS is considered the ace application in the mobile industry. Over 150 billion text messages were sent in the UK alone in 2011 (https://www.textmarketer.co.uk). It seems to be the most frequently used option in imparting language instruction as well. In many studies, it was employed and positive results were reported on its efficacy (Alavinia & Qoitassi, 2013; Chen, Hsieh, & Kinshuk, 2008; Motallebzadeh & Ganjali, 2011; Yang, 2013). In addition, the skill area of the choice seems to be vocabulary acquisition (Duman, Orhon, & Gedik, 2015; H.-S. Kim, 2011; H. Kim & Kwon, 2012).

Teachers and students alike have embraced the idea of mobile learning with a lot of enthusiasm. The salient popular feature of such learning are mobility and ubiquitous access. The teachers liked the idea as it gives them a lot of options to present instructional material in interesting ways (Oz, 2015). The students also like the idea of mobile learning because of its mobility feature, the convenience it affords in terms of time management and the option to engage in group work (Anaraki, 2009; Deng & Shao, 2011; Tai, 2012; L-H Wong & Looi, 2010). The design of MALL tasks needs special attention. The tasks should be user friendly, sensitive to the social and cultural setting and engaging and short. Built around these guidelines, the MALL tasks have a lot of potential for learning (Stockwell & Hubbard, 2013).

3. MAMALL

Initially, 15 studies were selected for the meta-analysis but two studies were dropped because of highly inconsistent results. The meta-analysis was undertaken to shed light on the lessons learnt through research so far. The need for this kind of analysis was felt by Glass (1976). There is a growing body of evidence being accumulated in research articles individually, which has given rise to the need that this evidence may be collected and informed analysis is conducted of what has already been learnt. MALL is relatively young field, which can benefit from the type of inquiry undertaken in this meta-analysis. A collection of annotated bibliography (Burston, 2013) brought forth interesting information. Bulk of research on MALL has been published in diverse type of journals while only 10% research is reported in CALL journals. Absence of a MALL dedicated journal makes the meta-analysis studies more beneficial.

4. Hypotheses and Objectives

The meta-analysis sought to answer the following research questions.

1.   How effective is Mobile Assisted Language Learning in teaching EFL?
2.   Is Mobile Assisted Language Learning effective for certain age group of learners?

The studies reviewed in the literature review point to the efficacy of Mobile Assisted Language Learning in teaching EFL. It is also evident that the area of choice so far is vocabulary acquisition. Almost all the studies consistently produced positive results. The participants seem to benefit from this new platform. An effort was made in this meta-analysis to collect quantifiable information from the studies included in the analysis to glean knowledge from the information dispersed in these studies (Glass, 1976). Majority of MALL studies out of 54 (Viberg & Grönlund, 2012) had no mention of theory. Experiment was found to be the favoured method. The experimental methods are favoured because they are better than no experiment at all (Cooper, Hedges, & Valentine, 2009).

5. Methodology

This section describes the methodology used in this meta-analysis. It also discusses the methods through which studies were searched and retrieved.

5.1 Literature Search

Literature search was conducted using different databases including ERIC, digital libraries of University of Jeddah, Universiti Malaysia Pahang and Google Scholar. There were 25 MALL studies collected through these searches. Out of these, 13 were used in this meta-analysis. Others were rejected as they did not match the criteria as described below:

5.2 Criteria

The following criteria for inclusion were set:

a.   The study was published between 2008 and 2015.
b.   The study used quasi-experimental method.
c.   The study report or part of it had pretest, posttest design with a control group.
d.   The study used mobile device or devices for intervention

Thirteen studies satisfied the above-mentioned criteria and were included in the meta-analysis.

6. Study Characteristics

Following study characteristics were studied:

a. Sampling procedure
b. Sample size
c. Participants grade level
d. Target language area
e. Duration of treatment
f. Type of instrument used (standardized vs researcher made)
g. Type of application used for treatment

The above-mentioned characteristics of the studies in the meta-analysis were tabulated. As presented in the tables below, most of the studies about 31% reported here were published in year 2011(table.1). Iran topped the list in the countries where these studies were originated. About 38.5% studies were done in Iran followed by China and Korea about 15.5% each. Conspicuously, no study from an Anglophonic country was reported (table.2). Majority of studies used researcher made or non-standardized instruments for data collection about 61.5% while about 38.5 % studies used standardized instruments (table.3). All studies in this meta-analysis except one that used PDA (Personal Digital Assistant) used mobile phones as platform on which content was delivered (table.4). Application of choice for learning content delivery was SMS about 65.5% followed by dedicated applications about 30.8% (table.5). Sample size of about 54% studies was between 30 to 50 subjects. One study had sample size between 100 to 200 subjects (table.6). Majority of studies 84.5% had treatment duration of between 1 to 10 weeks. Only one study which 7.7% of the studies included in the meta-analysis had a treatment period of six months (table.7). Majority of the subjects about 54% in these studies were sophomore students. They were in their first or second year at the universities. Only one study 7.7% had fifth grader subjects (table.8). Target language area in about 93% of the studies was vocabulary. Only one study targeted grammar (table.9).

Table 1. Year of Publication

Year	Number	Percentage
2008	1	07.7
2010	3	23
2011	4	30.7
2012	2	15.3
2013	1	07.7
2015	2	15.3
Total	**13**	**100**

Table 2. Studies by Country of Origin

Year	Number	Percentage
Korea	1	07.7
Netherlands	1	07.7
Thailand	1	07.7
Turkey	1	07.7
Taiwan	2	15.38
China	2	15.38
Iran	5	38.46
Total	**13**	**100**

Table 3. Type of Instrument Used for Data Collection

Instrument	Number	Percentage
Standardized	5	38.46
Non-standardized	8	61.53
Total	**13**	**100**

Table 4. Platform Used for Content Delivery

Platform	Number	Percentage
Mobile Phone	12	92.3
PDA	1	7.7
Total	**13**	**100**

Table 5. Application Used for Content Delivery

Platform	Number	Percentage
SMS	8	61.54
Special Application	4	30.77
Unknown	1	7.7
Total	**13**	**100**

Table 6. Statement of Sample Sizes

Year	Number of studies	Percentage
30-49	7	53.9
50-100	5	38.47
100-200	1	7.7
Total	**13**	**100**

Table 7. Treatment Duration of the Studies

Weeks	Number	Percentage
1-10	11	84.61
11-20	1	7.7
21-30	1	7.7
Total	**13**	**100**

Table 8. Grade Levels of Participants

Grade Level	Number	Percentage
K-5	1	07.7
K-10	2	15.38
K-12	1	07.7
Sophomore	7	53.9
Undergraduate	1	07.7
Total	**13**	**100**

Table 9. Targeted Language Area

Skill	Number	Percentage
Vocabulary	12	92.3
Grammar	1	7.7
Total	**13**	**100**

7. Effect Sizes

Effect size refers to the magnitude of effect made by the treatment. It has been identified as an important measure in evaluating research outcomes (Cohen, 1992; Cooper et al., 2009; Kline & Association, 2004). It is scale free measure

originally proposed for research in psychology and is used in other social sciences such as language studies. Importance of effect sizes multiplied with the advent of meta-analysis in late 70s (Glass, 1976) and more recently with growing dissatisfaction with statistical testing of the hypotheses (Kline & Association, 2004). Scary possibility of getting every result significant if a large enough sample size could be employed (Thompsons & Snyder, 1998), has brought some researchers to the point that they have started advocating a ban on statistical testing. There is growing pressure on researchers to report effect sizes in their research reports.

Calculation of effect sizes is not as straight forward as it sometimes looks at the surface. There are two competing approaches to calculate effect size of a study or of studies for the purpose of meta-analysis. One approach is to calculate it as d commonly known as Cohen's d which is calculated on the basis of mean scores of the treatment and control groups and pooled standard deviation. Cohen (1992) provided some guiding scale in which .2, .5 and .8 are suggested as small, medium and large sizes respectively. There are two more variations of this approach in form of Hedge's g and Glass's □ which are basically slight improvements of d calculations (Turner & Bernard, 2006). Second approach is called r type effect size. This approach calculate effect size through t value and degrees of freedom. To satisfy one of its assumptions of normal distribution r is transformed into Fisher's z (Kline & Association, 2004; Rosenthal, 1991).

In the present meta-analysis, the d type effect sizes were calculated first for each study along with Hedge's g with the help of a calculator downloaded from http://www.stat-help.com/. In the second step, r type effect sizes were calculated through a calculator downloaded from http://www.uccs.edu/~lbecker/. These effect sizes were transformed into Fisher's Z to satisfy normal distribution assumption through the following formula:

$$Z_r = \frac{1}{2} log_e \left[\frac{1+r}{1-r}\right]$$

Z_r scores were then multiplied by (n-3) to get weighted effect sizes accommodating sample sizes (table. 10). Overall Z_r and standard error were calculated through the following formulas:

$$Z_r = \frac{\sum(n-3)z_r}{\sum(n-3)}$$
$$Standard\ Error = \sqrt{\frac{1}{\sum(n-3)}}$$

Table 10. Effect Sizes of the Studies

No.	The Study	Sample n	Effect Size Z_r	Weighted E.S. (n-3)Z_r
1	Wu, Q. (2015)	199	0.43	40.38
2	Derakhshan, A., & Kaivanpanah, S. (2011)	43	0.30	5.79
3	Sandberg, J., Maris, M., & de Geus, K. (2011)	51	0.59	14.16
4	Chen, C.-M., & Li, Y.-L. (2010)	36	0.11	1.70
5	Kim, H.-S. (2011)	42	0.63	11.37
6	Azabdaftari, B., & Mozaheb, M. (2012)	80	0.61	22.61
7	Basoglu, E. B., & Akdemir, O. (2010)	58	0.09	2.24
8	Suwantarathip, O., & Orawiwatnakul, W. (2015)	80	0.31	11.50
9	Baleghizadeh, S., & Oladrostam, E. (2010)	40	0.55	9.42
10	Zhang, H., Song, W., & Burston, J. (2011)	64	0.30	8.23
11	Hayati, A., Jalilifar, A., & Mashhadi, A. (2013)	45	0.80	21.71
12	Alemi, M., Sarab, M. R. A., & Lari, Z. (2012)	45	0.23	3.21
13	Lu, M. (2008)	30	0.34	4.14

8. Results and Discussion

In this section the results of the analysis are presented. As shown in the table 11 below, the overall effect size was 0.425 ($ES = 0.425$) which is markedly different from 0 as Z combined was found to be 8.156 which is greater than 1.96 for $\alpha = 0.05$ in standard normal distribution. Standard error was calculated as 0.0521 ($SE = 0.0521$). Lower and upper limits for 95% confidence interval were found to be 0.323 and 0.527 respectively.

Table 11. Results of the Meta-analysis

Effect size	Z Combined	Standard Error	Confidence Interval 95 %	
			Lower Limit	Upper Limit
0.425	8.156	0.0521	0.323	0.527

MALL has come a longway since Chinnery (2006) used the term first time. Over all results of the present meta-analysis suggest that intervention through mobile phones helps in EFL learning. Similar results have been reported in (Lim Abdullah et al., 2013; Miangah & Nezarat, 2012). Research in the field of MALL seems to be in disarray as there seems to be no dedicated journal for MALL studies. Bulk of literature comes from conference proceedinds (Burston, 2014). As evident from present meta-analysis, major focus of the research is vocabulary acquisition (Chu, 2011; Duman et al., 2015; H. Kim & Kwon, 2012). In view of the critical importance of vocabulary especially in EFL settings MALL is emerging an important tool for vocabulary instruction. Present study seems to confirm the view that mobile phones with their increasing capabilities to provide connectivity in a ubiquitous environment can be used as effective tools for delivering lnguage learning content. As in this study and elsewhere (H. Kim & Kwon, 2012; Motallebzadeh & Ganjali, 2011) as well it is found that MALL activities have been mostly directed at sophomore students. As for as the second research question regarding age of the learners is concerned there was no pattern discovered to indicate that MALL intervention is useful only for certain age group. It has been found effective with learners irrespective of their age. However keeping in view the number of studies included in this meta-analysis ($N = 13$), the findings may be interpreted more cautiously.

Staticians believe that a publication bias might exist because of which studies that do not have significant results are not published. This is commonly referred to as "The File Drawer" problem. As for as the present meta-analysis is conecrned, the number of studies which could have existed but were not published because of this bias is calculated through the following formula by Rosenthal (1991):

$$X = \frac{(\Sigma z)^2}{2.706} - K$$

According to the calculations 51 studies are needed to reverse the findings of this meta-analysis.

As shown in the figures below, there was no corelation visible between either the grade level and effect sizes (figure.1) or between the sample size and effect sizes (figure.2). it can be concluded that effect of MALL seems independent of grade level and sample size.
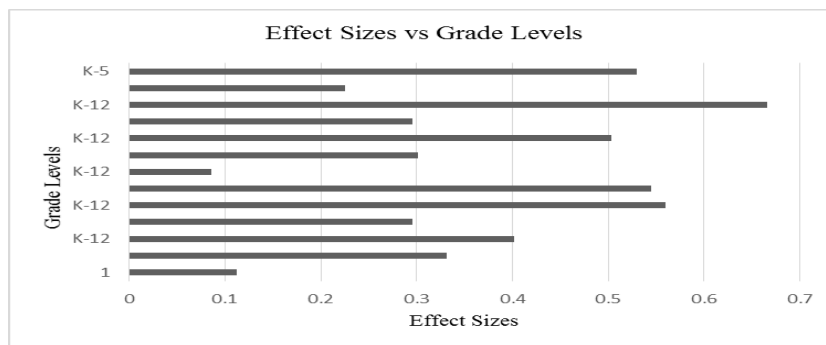

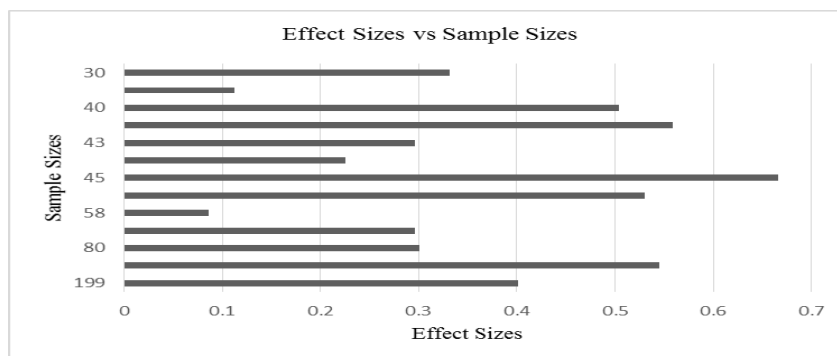Figure 1. Effect Sizes vs Grade Levels

Figure 2. Effect Sizes vs Sample Sizes

9. Limitations

The present meta-analysis like all other inquiries in social science has some limitations. Firstly, the number of studies included in the analysis was very small. MALL is relatively a young field only a couple of decades have passed since its

beginning in mid-90s. That is one reason for the shortage of studies. Another reason may be absence of a dedicated journal for MALL. Secondly, only studies reporting mean scores and standard deviations for control and treatment groups were included.

10. Conclusion

Mobile Assisted Language Learning has emerged as a potential assistive tool in the complex process of language learning. Technological advances in the last quarter of the last century have made it mandatory for the teachers to employ technology as a tool to help in the process of teaching and learning. The present meta-analysis was conducted to synthesize the lesson learnt so far in the field of MALL. The findings confirm the efficacy of the platform of MALL in EFL instruction.

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Appendix
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